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ABSTRACT

This student manual and the accompanying instructor's guide (CE 010 376) are directed toward exploring manufacturing occupations. It is designed to help the student explore the various career, occupational, and job related fields found within the manufacturing occupations. Four sections are included. An overview of career education and manufacturing history is presented in the first two sections. The third section, Guidelines for Participation in a Careers Exploration Program in Manufacturing Occupations, presents generalized program team and student information models and discusses the student role. The last section, which constitutes the majority of the document, contains 21 program product categories, each containing an industry definition, types of products, importance, typical jobs, expected working conditions, and the future of the industry. The program product categories are Ordnance and Accessories; Food and Kindred Products; Tobacco Processors; Textile Mill Products; Apparel and Other Finished Fabric Products; Lumber and Wood Products; Furniture and Fixtures; Paper and Allied Industries; Printing, Publishing, and Allied Industries; Chemicals and Allied Products; Petroleum Refining and Related Industries; Rubber and Miscellaneous Plastics Products; Leather and Leather Products; Stone, Clay, Glass, and Concrete Products; Primary Metal Industries; Fabricated Metal Products, Machinery and Transportation Equipment; Machinery, Except Electrical; Electrical Machinery, Equipment and Supplies; Transportation Equipment; Professional, Scientific, and Control Instruments; and Miscellaneous Manufacturing Industries. (SH)

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THE MANUFACTURING CLUSTER

EXPLORING MANUFACTURING OCCUPATIONS

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STUDENT'S MANUAL

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CE 010 397

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This document is part of the Manufacturing Cluster Series which addresses itself to career awareness, orientation, exploration and preparation.

The series includes student manuals and instructor guides for use at the secondary level.

The list of titles in this series is as follows:

Exploring Manufacturing Occupations: Student's Manual

Exploring Manufacturing Occupations: Instructor's Guide

Occupational Preparation - Inspection and Quality Control: Student's Manual

Occupational Preparation - Inspection and Quality Control: Instructor's Guide

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FOREWORD

This Student Manual is for use in the exploration phase of a career education program. The Manual is directed toward exploring manufacturing occupations and is to be used with the Instructor's Guide in the same program area.

The intent and purpose of this Manual is to help the student explore the various career, occupation and job fields found within the manufacturing occupations.

Generalized graphic and descriptive examples are presented for use by the student as a means for conducting selection, exploration and direction activities in the planning of careers, occupations and jobs within the manufacturing occupations.

The use of the models and related information is intended to provide direct articulation between the awareness and orientation phases of career education in content and purpose. The exploration phase is an integral part of the preparation phase of career education. This is provided by utilizing the models in a ladder-of-knowledge method. Later, advanced knowledge, skills and attitudinal components will be added as the specific areas to be explored and prepared are selected and studied.

No single program is offered as being the way to conduct exploration activities. Program design and development techniques and methodologies are included in the Instructor's Guide. The characteristic nature and diversity of manufacturing occupations preclude a course development model being applicable across the board.

What is most important in the conduct of this course is the students' active participation in both design and operation. These functions are sensitive to student desires, interests and purposes. This Manual was designed to help students actively participate in the program in order to maximize their goals and purposes.

The prime purpose of this Manual is to help students. It is sincerely hoped that this will be the case.

John E. Radvany
Deputy Assistant Commissioner
New Jersey Department of Education
Division of Vocational Education

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As with any project encompassing such a diversified field as Manufacturing Enterprises, this is the result of the efforts of countless persons who have supplied the knowledge, and the facts upon which it rests. Philosophy, rationale, information, critique, testing and change have been reviewed by special personnel who worked on, or supplied information to this project.

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The Manufacturing Cluster Series of which this is a part represents an effort in curriculum development by the United States Office of Education, the New Jersey Department of Education and Fairleigh Dickinson University.

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Career Education

INTRODUCTION

The American educational system has been described as the greatest achievement in democratic processes attempted by any people. The system was built upon the concept of equal educational opportunity for all. Its goal is to allow each person to become trained and/or educated to a level commensurate with their inherent capabilities. In support of this concept and goal, it was required that compulsory attendance in the school system, from six to 15 years of age, be maintained. The concept, goal and requirement of American education differ markedly from the educational systems of many countries.

While it was possible to meet the requirement of compulsory attendance, meeting the idealized goals has been a problem. Attainment of the goal and concept has been a concern of the political, technologic, economic and sociologic systems during the history of this nation.

A major forward step came immediately after World War II, when all of the various systems concentrated on human resource development in the educational delivery system. During the period of time from the late 1940's through the 1960's, legislation supported integration and attendance to minority group educational interests and problems; technology enabled industrial, trade, commerce and general business expansion and, at the same time, created new occupations and jobs.

After the 1960's a major charge evolved from general society. The massive and dynamic change period generated the statement that education was neither meaningful nor relevant. The educational system and all interfacing systems are attempting to provide both an answer and new posture to address that charge. One of the approaches is called Career Education. It is to this charge that Career Education programs are addressed, formed and operated. The manner of approach is to examine the career work related components of human endeavor and to determine how educational systems can be utilized to enhance the life-cycle human career dimension.

CAREER EDUCATION CONCEPT

The term Career Education, is a concept comprised of many and varied sub-concepts, all centering in education but related to many factors concerned with life and work.

The primary process used in this manual is representative of Career Education, its concept and scope.

CAREER EDUCATION GOALS

The major goals of Career Education are:

1. To make all education more meaningful and relevant to individuals and their career development.

2. To provide the guidance, counseling, and instruction necessary to develop self-awareness and self-direction; to expand occupational choices and aspirations; and, to develop appropriate attitudes toward the personal and social significance of work.

3. To ensure the opportunity to learn a marketable entry level skill prior to leaving school.

4. To provide knowledge and skills requisite to further education and employment upon completion of secondary school programs.

5. To assist the individual in finding employment or in receiving further education.

6. To utilize community resources in the education system.

7. To increase the available educational and occupational options through a system which will permit entry and reentry into either the world of work or an educational system.

SCOPE OF CAREER EDUCATION

Career Education is a comprehensive educational program beginning in childhood and continuing through adulthood. The subject-oriented curriculum of the elementary and secondary schools is restructured to include career development. In the

primary grades, Career Education is as important a component of the educational system as reading, writing, and arithmetic. The students explore the world of work and familiarize themselves with many occupational fields and gain an insight into, and a respect for, both work itself and the people who work. In junior high school, the student studies the structure of occupational fields and begins experience-centered learning in each of these fields. In the eighth or ninth grade, students explore various jobs and job families, so that by the tenth grade, they have already gained initial entry level employment skills.

Career Education prepares the student, leaving the school system, with both employable skills and a foundation for building new and improved occupational levels in the future. Also, Career Education recognizes that people may reenter the educational system at any point for upgrading skills or learning new techniques.

PHASES OF CAREER EDUCATION

Career Education, as initially conceived, consists of four phases as in Figure 1, page 5.

Phase I - Career Awareness
Phase II - Career Orientation
Phase III - Career Exploration
Phase IV - Career Preparation

Phase I - Career Awareness

Career Awareness is a major departure from the traditional concepts of vocational education. It was formerly thought that work preparation should start in high school. Research, however, has repeatedly shown that the early years are the most important learning years. Since Career Education is concerned with both work and work attitudes, it is important to introduce Career Education at the beginning of formal schooling. During Phase I students will become acquainted with all of the Career Education fields and learn that work is honorable, respected, and important.

Phase II - Career Orientation

Career Orientation, which normally begins in junior high school, assists students in identifying talents, aptitudes, interests and work requirements in the world of work. They will not only acquire the basic knowledge necessary for making a career choice, but they will also learn the structure of career fields, and the variety of job levels in each. The concept of career ladders will become clear and the student will be able to apply it

to several selected career fields. Faculty members and counselors, as well as resource persons from business and industry could all participate in programs, each offering their own special services to students in the Career Orientation phase.

Phase III - Career Exploration

Career Exploration means in-depth study of several jobs or job families through simulation, vicarious experience, and hands-on opportunities. The basic objectives of this phase are:

1. To provide in-depth exploration, beginning specialization, and skill development training in a selected occupational field/job family.

2. To improve student performance in basic and related subject areas with emphasis on career development.

3. To provide information and guidance in the selected occupational family in conjunction with entry level job preparation and/or preparation for continuing education.

Phase IV - Career Preparation

Career Preparation, the attainment of intensive skill, technical knowledge, work habits, attitudes and safety judgment in one or more jobs or job families, is the final step in Career Education. The objectives for Career Preparation are:

1. To provide specific training in a chosen occupation/occupational family in preparation for job-entry and/or further education.

2. To improve student performance by relating studies to the chosen area of work.

3. To provide occupational information and guidance with job preparation, as well as prepare the student for further education and direction.

4. To insure that students meet the job-entry, and/or advanced educational prerequisites of education and skills needed for their occupational-career choices.

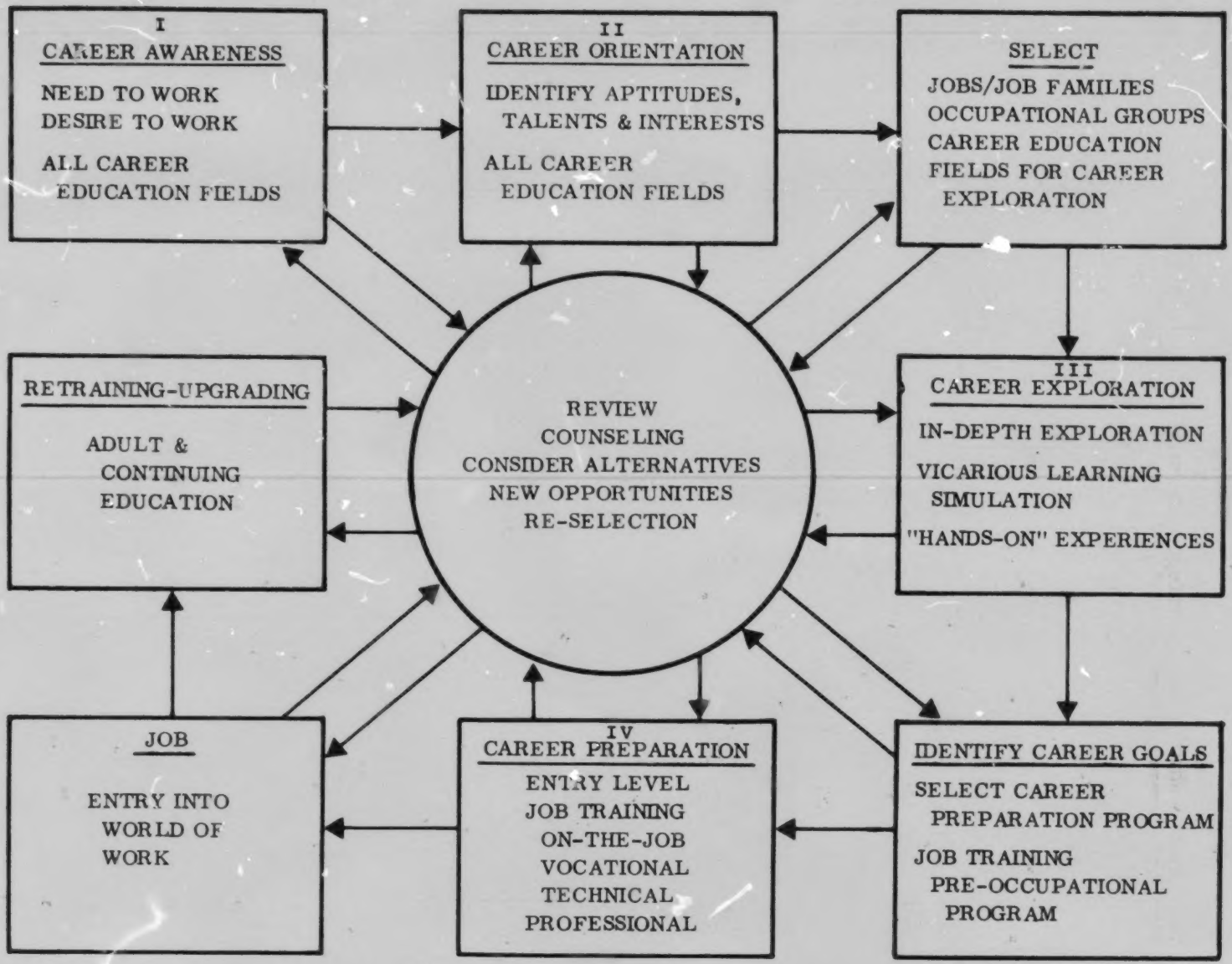


Figure 1 - Phases of Career Education

SUMMARY

The basic concept of Career Education is that it is an educational vehicle which attempts to integrate the work-related aspects of careers, occupations and jobs within the framework of human development in given or selected environments.

Career Education is:

1. To make all education more meaningful and relevant; and,

2. To provide an environment and opportunity for all students to acquire attitudes, knowledge and skills at their chosen level and in their chosen career field.

The scope and phases of Career Education cover the normal educational life span of most students, from elementary through secondary schools in four phases, namely: Awareness (Grades K-5); Orientation (Grades 6-8); Exploration (Grades 9-10); and, Preparation (Grades 11-12). Also, Career Education continues similarly through post-secondary, higher education, adult and continuing education.

The Manufacturing Enterprise

BRIEF HISTORY

Manufacturing is an enterprise that uses land, capital, and labor to produce goods. It is the process by which man adds utility to the materials that nature furnishes and includes such enterprises as textile mills, factories, mines, electrical power plants, meat packing houses, food canneries, and petroleum refineries.

Production in an enterprise begins with natural resources such as land, minerals, water, and timber. Without natural resources man could neither survive nor improve his standard of living. Yet, in their original state, most natural resources do not satisfy human wants. Therefore, these natural resources must be processed to suit needs and desires. This is accomplished by manufacturing enterprises.

From the beginning of time, people spent a greater part of their waking hours searching for food necessary for survival. In the Paeolithic Age, tools appeared for the first time and man began to change from hunter to producer. During the Neolithic Age, man was using the loom, the wheel, and the kiln. Technological development progressed through the ages and eventually led to the Industrial Revolution. At the beginning of the Industrial Revolution, there were new materials, better tools, and more efficient machines. Conversely, the number of farmers decreased substantially as rural people migrated to the towns and cities. The industrial society had begun and it was to drastically alter the life of all people.

In earlier times, most goods were produced in the home. As technology developed, manufacturing operations were transferred from the home to the factory and goods were produced with machinery rather than totally by hand. The growth of capitalism and private enterprise paralleled the rise of the Industrial Revolution. Many new machines were invented. One of these, for instance, was Hargreaves' invention of the spinning jenny. This made it possible to produce more goods per day than ever before. Consequently, as prices went down more people could afford to buy the goods. Increased production and decreased labor costs resulted as factories located on stream banks and water-powered machines replaced hand-powered machines.

American manufacturing dates back to the first permanent English settlement in the New World. In 1620, New England ship-builders found the natural resources they needed--hard woods, soft

woods, and pine sap from which to make turpentine, resin, and tar. Saw mills were operating as early as 1631. When iron ore was discovered in Massachusetts in 1654, John Winthrop, Jr., son of the Governor of the Massachusetts Bay Colony, went to England and brought back both equipment and skilled iron makers. Braintree, Massachusetts, was the site of the first iron furnace in the colonies. In 1665, Groton, Connecticut, gave twenty acres of land to a group who built a mill for grinding corn. The output of such colonial industries as these eventually helped make political and economic independence possible for the United States. The people who founded America realized the importance of trade and manufacturing as they pertained to continued independence and growth.

In the 18th and 19th centuries, a family lived on what they raised on the family farm; used the tools made by father and sons; and, wore the clothes spun and sewed by mother and daughters. There was also some exchange of simple goods between neighbors. The early settlers, however, had come to the New World to make a better living and to live better, so even in the log cabins of frontier villages there was fine English china, English woven cloth, and other English manufactured goods.

During the wars of 1776 and 1812, the United States could not depend on England for manufactured goods. Factories, of remarkable diversity, began to spring up across America, setting the stage for the American Industrial Revolution.

Toward the end of the 18th Century, a number of inventions ushered in the Industrial Revolution in the United States.

Eli Whitney, the inventor of the cotton gin, demonstrated the value of interchangeable parts in making and repairing rifles. During the American Revolution each rifle had been painstakingly made by hand. The hammer of one would not fit the trigger of another, the barrel of one could not be used with the stock of another; if one part in a rifle broke, the entire gun had to be sent to a gunsmith to be repaired. Whitney's ideas resulted in the molding or stamping of identical parts. Assembling standard parts into a finished product, rather than handfashioning individual parts, saved both time and money. Eli Terry, a New England clockmaker, who was one of the first to use this mass production method, turned out standardized clocks by stamping out identical gears. His clock prices dropped from $25 to $5 per clock by using this assembly technique.

In 1769, James Watt developed the steam engine. A mine operator then put the engine on wheels and pulled coal over wooden rails to the nearest town. This was the beginning of the railroad. Factory owners soon learned that steampower was less expensive than manpower, more convenient than waterpower, and were

quick to utilize it in factories. During the first year that steampowered sewing machines were used in the manufacture of shoes (about the time of the Civil War), the shoe industry doubled its highest previous annual output.

Farmers also benefited by industrial inventions. Cyrus McCormick developed the reaper and soon thereafter there were steam plows, mowing machines, and threshers. On the seas, steam driven ships began to take the place of sailing ships. Machines driven by steam made more machines driven by steam. In 1860, the United States was the fourth largest manufacturing country in the world and by 1894 it was the first. By 1917, this country's manufacturing created as much wealth as the next three highest industrial-oriented countries combined.

The assembly line method of production was another powerful force in implementing and modernizing manufacturing. Mass assembly techniques, begun in 1903 by Sears Roebuck, led to Henry Ford's assembly line production of automobiles. The era of mass production with reduced costs began. Formally designed luxury items were available to the American wage earner for the first time.

It is estimated that production technology and methods have made it possible for the average American worker to produce 250 times more in one day than is produced by a worker in an underdeveloped nation. The expansion in production technology and methods goes on and will continue to go on as long as inventors and scientists have incentive and reason to discover new machines and methods for production purposes.

Technological advancement has continued at an ever increasing rate. It is estimated that there have been more new inventions since 1960 than in all previous history. The impact of space exploration, for instance, is just now beginning to appear in all forms of industrial enterprise. Space technology has resulted in stronger but lighter materials and smaller but more sensitive electronic equipment. New systems of management and production have been developed.

Perhaps the biggest advance in technology and manufacturing in the past twenty years has taken place in the field of communication. The impact of computers and electronic communication devices is startling. Future manufacturing holds both the promise of new development and the challenge to meet the needs of an expanding population with its ever increasing appetite for more goods.

The principal function of manufacturing is to produce the goods desired by society. This process creates jobs, income for workers, goods for customers, and profits or losses for owners.

A manufacturing firm that does not produce a marketable product cannot continue to exist. We are all consumers, and we expect the products we buy to be of satisfactory quality and at a price we can afford. Technology and advanced manufacturing techniques have made it possible to lower the prices of goods to within the reach of increasing numbers of people.

CHARACTERISTICS

Manufacturing enterprises have certain characteristics in common whether they are large or small. However, there are differences in the type and kind of characteristics. There are great differences in scope, purpose, work force composition, tools, machines, and facilities when comparing a General Motors automotive plant with that of a lamp shade plant. The following characteristics are common to all manufacturing concerns:

FACILITIES

Facilities include buildings, grounds, and equipment necessary to house and support the enterprise.

FINANCE

Manufacturing requires money. Money may be borrowed to start the enterprise--from banks, private individuals (stocks and bonds) and other sources. Money is a resource needed in day to day operations to convert materials, machines, and services, into products. Manufacturing enterprise represents money invested. However, it also provides economic growth by its internal and external cash flows on a day to day basis.

MACHINE TOOLS

A very familiar characteristic of manufacturing is its machine-tools (machinery). These range from simple hand tools (files, hammers) to giant computer-run machinery capable of great accuracy. The nature of the machinery necessary to manufacture the products of a particular manufacturing enterprise influences the type and kind of worker that can be employed (skilled or semi-skilled).

The type and kind of machine tools also indicate whether or not the manufacturing enterprise is to be mass production or limited production in scope.

WORK FORCE

Another familiar characteristic of manufacturing is the work force. The work force includes all who work in and for the enterprise. This range covers the entire scope of occupations from president of the corporation to external field personnel in regionally located warehouses. Since late in the 1800's many classifications have been made to the work force. These range from unionized work force through professional, scientific and skilled/unskilled.

MATERIALS

Although you may have facilities, finance, machine tools and a work force, in order to operate you need materials. This materials classification characteristic ranges from raw materials (ore, furs, oil) to finished materials (products and equipment). The term materials is both specific and comprehensive in coverage, as it is used in general society and in manufacturing enterprises. Materials to the foundry can be the ore from which iron-steel is to be made. Materials to the assembly line worker can be completely finished component parts such as electrical wiring and electronic components as well as tape. Usually, some interpretation of this term is needed as it is used in characterizing both the manufacturing enterprise overall as well as in examining its internal structure.

TIME

While time, in and of itself, is not generally used as a hard characteristic describing manufacturing enterprise, it is a major factor to be considered in operations. Today, there is a fast-food business; the automotive industry manufactures a given number of cars per day. Generally, the work force is paid by the hour. Money is borrowed on time-bases. Machines are operated and maintained on a time-schedule. Time-delivery is money to the manufacturing plant. Time is a very real commodity used by manufacturing enterprises. The use of time determines whether or not they make a profit, take a loss or stay in business.

Although many times a characteristic of the manufacturing enterprise is spoken of in terms of an environment-of-manufacturing, this cannot be classified, properly, as a commonality. The environment takes on many dimensions such as a worker's view of working times, compatibility with fellow workers, level of air quality, heating and parking facilities.

A manufacturing enterprise has two environments, internal and external. The internal environment is composed of all the characteristics aforementioned and their actions and inter-actions

within the physical confines of the plant. The external environment is comprised of the local community, customers and the affects/effects of the national manufacturing community as well as government controls. The many differences in elements comprising manufacturing-environment precludes using this as a typical characteristic. Mistakingly, this is usually treated solely or mainly as being equivalent to working conditions, not truly the case. For this reason, environment is not treated in this guide as a common characteristic of manufacturing enterprise.

PRODUCTION AND PRODUCTIVITY

Production is defined as the creation of a utility or the changing of materials into more useful goods and services. It is necessary because most raw materials in their natural state do not provide sufficient utility. There is an important difference, however, between production and productivity. Production refers to the total quantity of goods produced whereas productivity refers to the production quantity in a specified time period.

Productivity may be defined as a measurement of output per man-hour, or as the relationship between input (factors necessary to produce goods and services), and output. Many factors determine productivity and it is often difficult to determine which contributes most to any given increase in efficiency. Some of the important factors in productivity include:

1. technological improvements reflecting the ingenuity of inventors, engineers and scientists;

   A complete change in the use of energy has taken place since the mid-1850's when almost all industrial effort was human-powered. Today almost all of the energy used in production is electro-mechanical.

2. management factors reflecting new skills and knowledges as well as attitudinal changes and influences;

   Many increases in productivity result from organizational and procedural improvements rather than from increases in man-machine energy and capability. Recognition of these factors, especially with management systems, plus increased knowledge of man-machine efficiency developed during the last decade, have enabled management labor to increase production and productivity.

3. financial factors which determine the availability of capital;

   The availability of a technological innovation does not mean it will be utilized. Someone must be willing to adopt it and this requires capital investment. Capital or money is supplied by individual investors. Private ownership of American manufacturing firms is broadly based. The corporate form of business, where many investors pool their capital to form a single company, has been a major factor in industrial expansion over the past century.

4. labor factors, which include work attitudes and skill levels;

   Employee experience, work attitudes, skills, health, and morale are important human factors affecting productivity. Even the most modern automation devices must be people-maintained and people-directed. The greatest resource of any organization is its human resource.

5. government regulation of such natural resources as land, mineral deposits, air, water and forests;

   Continued increase of consumer demands has decreased natural resources and had made the availability of natural resources an economic factor in manufacturing. Government, therefore, has had to regulate resources. Industry has had to promote invention and use of new materials or the recycling of used materials in order to maintain productive capability.

Society can raise its standard of living by increasing its production of goods and services. The measure of its success is determined by how well industry produces. The American economic system has been more successful than any other in satisfying consumer demand.

CHANGES AND PROGRESS

Since 1950, technological advancement has been so great that it has been said America is undergoing a second industrial revolution. Manufacturers continue to make great strides to meet the increasing demands of consumers. Yesterday's dreams are today's necessities. Manufacturing will continue to play an essential role in society's quest for better products. Since World War II society has become much more complex and its demand for goods and

services has expanded dramatically. Manufacturing is a principal element in the level of the American economy both by its capacity to produce and in its ability to provide employment. Unquestionably, the future will see continued changes in manufacturing and even greater demands for new products and services.

MANUFACTURING AND SOCIAL PROGRESS

Historically, social progress reveals an ever increasing gain in providing better education for more persons; increasing life expectancy; providing opportunities to greater numbers of people in cultural and recreational affairs; and, generally, increasing standards of living. Social progress is usually linked with the manufacturing enterprise through the fields of sociology, economics, technology and political endeavor.

Manufacturing is a direct reflection of all these fields and reflects the singular and combined influences of each. Manufacturing enterprises evolve from home-industries as they responded to such influences as:

more and cheaper goods;
response to technological improvements and efficiencies;
necessity for economic and political strength;
creation of opportunity for employment; and,
change dynamics of world markets.

The role of manufacturing enterprises is, at times, a leading factor in creation of new markets and materials; and, a lagging factor as it attempts to meet sudden demands for goods and services. This area of manufacturing enterprise can be seen and studied by reference to Gross National Product (GNP), which helps to reflect the level of inflation, recession, depression and growth.

Relative to education, manufacturing enterprise affects school systems by virtue of its forecasts for types and kinds of workers for their work force. The school system responds with revised curriculum and improved programs; utilization of new training techniques, methods and equipment; and, by providing guidance information and counseling to students at their various decision points.

The role of manufacturing enterprise changes with time and general social progress. As the capability for supplying needed and desired goods becomes attainable in a given time period, the company role shifts to include more service functions to the consumer.

A shift from primary manufacturing of goods to one of including services--customer relations, community relations, support of community activities, servicing and maintenance of goods, expansion in legal, financial, personnel and marketing activities--permits the scope of manufacturing enterprise in society to influence and be influenced by social progress.

THE STRUCTURE OF MANUFACTURING

The structure of manufacturing enterprise is shown in Figure 2, page 16. The elements of manufacturing are depicted as being inter-related by forming the elements into a three-dimension box. The elements are:

1. Functions:

   Management and selected sub-functions
   Support and selected sub-functions
   Engineering and selected sub-functions
   Factory and selected sub-functions

2. Processes:

   Acquisition of Raw Materials
   Formation of Standard Stock
   Components Production
   Assembling
   Finished Product
   Distribution

3. Products:

Products are numbered along the base of the box-figure from 19 through 39. The product categories are shown in Table I, page 17. A full range of products and related information about each category is found in this Manual.

This model of manufacturing enterprise is quite representative of any selected manufacturing industry for purposes of understanding the operations of manufacturing.

The model is useful for an overview of any function of sub-function of manufacturing for purposes of awareness, orientation, and exploration. In such dimensions as occupational profile, needed skills and knowledge, present and future career prospects, mobility in and between industries at a chosen career level, and career ladder progression, the model can be useful to the student.

Figure 2 - The Structure of Manufacturing

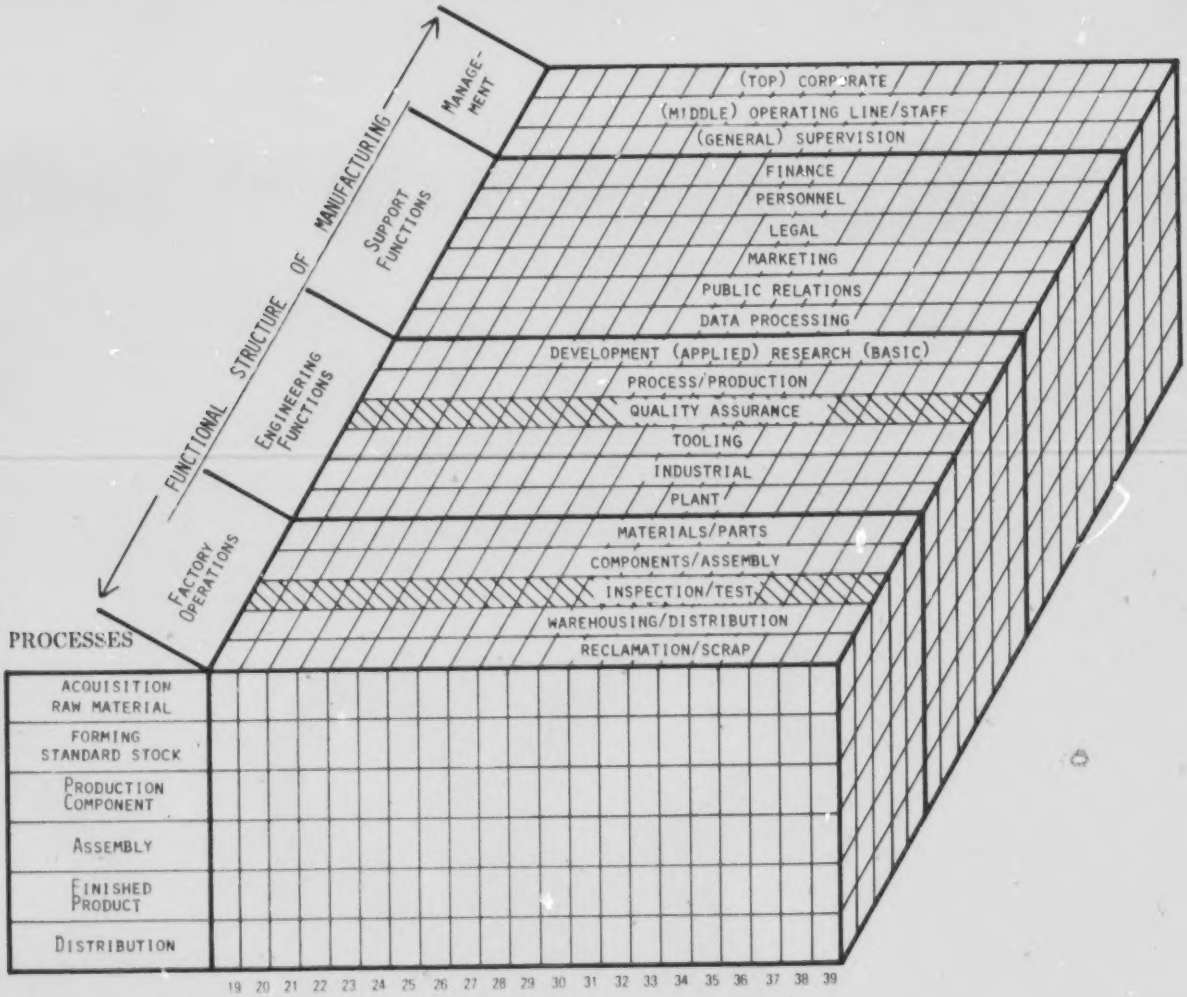


Table I

Standard Industrial Classification
Manual Industry Descriptors
Division D; Manufacturing *

GROUP	DESCRIPTION OF INDUSTRY
19	Ordnance and accessories
20	Food and Kindred products
21	Tobacco manufactures
22	Textile mill products
23	Apparel and other finished fabric products
24	Lumber and wood products
25	Furniture and fixtures
26	Paper and allied products
27	Printing,publishing and allied industries
28	Chemicals and allied products
29	Petroleum refining and related industries
30	Rubber and miscellaneous plastics products
31	Leather and leather products
32	Stone,clay,glass and concrete products
33	Primary metal industries
34	Fabricated metal products,except 19,35,36,37
35	Machinery except electrical
36	Electrical machinery
37	Transportation equipment
38	Professional,scientific and control instruments
39	Miscellaneous manufacturing industries

*STANDARD INDUSTRIAL CLASSIFICATION MANUAL. Office of Management and Budget. Executive Office of the President; Division D; Manufacturing; pp. 52-214; 1972.

Guidelines for Participation in a Careers Exploration Program in Manufacturing Occupations

INTRODUCTION

The purpose of this manual is to help a student to:

1. Understand manufacturing enterprise;
2. Select or reject further studies within the fields enumerated;
3. Provide a model for use in further or continuing exploration activities.

GENERALIZED PROGRAM TEAM MODEL

Because the scope and variety of manufacturing is so broad and the curriculum needs of the sending and receiving school systems many, a program team is normally comprised of school system and support system personnel as shown in Figure 3, page 19.

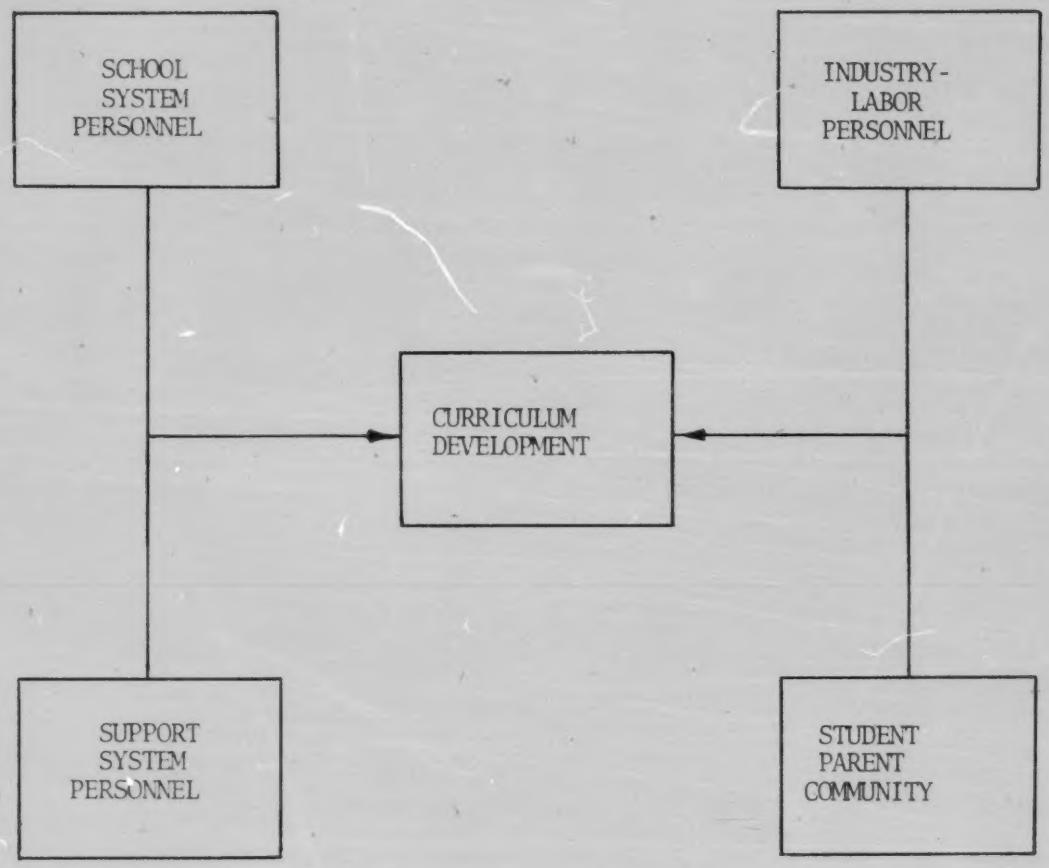
It is recommended that the program team be the requirement for development of a successful program in exploration and preparation activities concerned with manufacturing occupations programs. This is especially true when particular operational levels of manufacturing enterprise and occupations are studied, discussed and/or experimented with outside the manufacturing enterprise environment. In order to assure a functioning program in exploration or preparation study and activities, it will be necessary to have the combined knowledge, resources and skills of the program team available when needed.

THE STUDENT ROLE

Student participation has major importance as it is the reason for the program being in existence. The student is the direct recipient of skills, knowledges and attitudes in the selected career field chosen for exploration.

Student participation is active or passive. Generally, when active, the student should be prepared to:

Figure 3 - GENERALIZED TEAM MODEL



1. Provide information for program course goals and objectives;

   Information should be gained from student test results to determine capabilities in student selected interest fields; from counselling activities with school system and support system personnel; and, from general and related information gained in interviews on interests, personal goals and objectives in one or many occupational and/or career fields of the student. If this is not accomplished by the student, the courses developed on their behalf may not be meaningful or relevant.

2. Actively participate in program activities, both singly and in groups;

   Awareness and orientation about various careers, occupations and jobs can be gained by students interacting with each other in a work-activity group. Singly, a student can observe and think but not get feedback on thoughts or actions of others. This active participation will be similar to that encountered on-the-job in the real world.

3. Actively participate in program evaluation;

   Students should evaluate the program from their viewpoint. However, this activity is directly related to the first activity. Students can logically evaluate the program if they provide the inputs listed previously (they form the criteria for later evaluation). Failure to participate in both activities, 1 and 2, hinders any logical evaluation after the course is over. Much attention should be paid to this activity as it is planned for the students benefit.

In the passive role, the student should be prepared to:

1. Listen;

   This role is necessary. It needs the attention of all students. Much of the information about people in manufacturing occupations, careers, and jobs will come from lectures, speeches and general conversation. The information, in many cases, is not written.

2. Observe;

   This role, usually, is in combination with the Listen role above. This is especially true during audio-visual learning activities. Particularly, this will be a prime

mode of information acquisition during field trips to plants or watching demonstrations either in a manufacturing enterprise or laboratory.

The student can gain much by active and passive role participation. Much of the quantity and kind of information learned is directly related to the student's role as a program participant and not as a non-active receiver of information.

STUDENT INFORMATION MODEL

Students will be presented with a wide range of information about the manufacturing enterprise. No one can ever know all about manufacturing functions, processes and products. In order to help the student to acquire and process information for purposes of selection and exploration of career fields, the following models are presented.

COMPREHENSIVE MODEL

This model will serve a wide band purpose such as helping to determine what fields the student might have interest in exploring. Manufacturing enterprise can be looked at as being a huge information system or bank of knowledge. The types and kinds of information that may be useful to the student for selection and pre-exploration activities can be obtained by using the following model.

1. What is the descriptor(s) of the career or occupational field?
2. What is the scope and content of the field?
3. Where is the information about this field?
4. How can the information be obtained in a useful format?
5. How can or should this information be analyzed?
6. How can or should this information be utilized for my purposes?

Comprehensive Model will help the student to quickly explore career and occupational fields and begin to narrow down the vast field of career choices into more personally preferred areas. When this occurs, and more in-depth activities are desired or warranted, the separate Model will be more useful.

SEPARATE MODEL

This model is useful when a student has selected a single career or occupational field for exploration and wishes to attempt some activities that will aid in rejecting or continuing further exploration-selection choices. The student will follow the procedures of the following Separate Model.

1. Select a career, occupation or job family.

2. Interpret the function (duties, knowledge, skills, and attitudes) sub-function, occupation or job specifications of the field.

3. Assess or measure the function, sub-function, occupation or job selected.

4. Compare the function, sub-function, occupation or job specification versus the measurement (i.e. if you would attempt the job function, how do you measure the job and with what tools or instruments [status, money, requirement]).

5. Determine the conformance between the specification and measurement (i.e. Can you do it? When? Would you be happy doing that job and in that environment?).

6. Record the information (i.e. the information from steps 2 through 5).

7. Make a determination (i.e. to continue in pursuit of that career field or reject it and try another) about the career.

Students should find these models useful for their purposes in exploration activities. The models should help expedite exploration activities, especially in the selection phase.

Program Product Categories

INTRODUCTION

Reference is made to Table I, page 17. The product categories are shown as numbers 19 through 39.

The product categories, or one selected product category, can be used as a learning activity. When any category is selected and attempts are made to "manufacture" its products, the interrelationships between all functions, processes and the selected products can be determined. Selection of a product as an activity by which to understand a manufacturing enterprise raises questions like:

1. What functions have to be performed?
2. What processes have to be accomplished?
3. What characteristics will that type manufacturing enterprise encompass?

Any one product or product line can be used to "explore" manufacturing functions and processes.

In this section of the Student Manual, the product categories are listed by specific title and the following additional information about each category is supplied:

1. Industry Definition;
2. Types of Products;
3. Importance;
4. Typical Jobs;
5. Expected Working Conditions;
6. The Future of the Industry.

This information, when used with the structural and informational models contained herein, will enable the student to quickly explore manufacturing at all levels leading towards career, occupation or job field selection and in-depth exploration activities.

ORDNANCE AND ACCESSORIES

DESCRIPTION OF THE INDUSTRY

The ordnance and accessories manufacturing industries produce military products for land, sea and air forces. This industry is also engaged in manufacturing the related equipment necessary for effective defense systems.

TYPES OF PRODUCTS

1. Large weapons and vehicles

   Guns — Mortars
   Howitzers — Tanks
   Coast and Field Artillery (30mm bore and greater)

2. Assembled Guided Missiles and Space Vehicles

3. Ammunition for Naval Aircraft, anti-aircraft, tank, coast and field artillery

   Manufacturing, Loading, Assembling

4. Tanks and tank components

5. Sighting and fire control equipment

   Bombsights — Wind Correctors
   Percentage correctors — Sound locators

6. Arms and ammunition

   Small arms — Grenade launchers
   Arms with a bore less than 30mm — Heavy machine guns

IMPORTANCE

The ordnance and accessories industry produces military weapons for armed forces. In addition, the industry produces a wide variety of firearms for the many sportsmen in the country.

While costs associated with wars and the defense of this country have fluctuated greatly during the last fifty years; the so called "Cold War," Indo-China, the mid-east, and other world conflicts tend to keep expenditures for ordnance and accessories at a relatively high level. At the present time, it is difficult to assess future expenditures that will be necessary for American military forces. It is also difficult to forecast which ordnance categories will receive the greatest emphasis.

However, even without considering the costs associated with American military needs, vast numbers of sportsmen in this country will account for millions of dollars each year in small arms and ammunition. The size of this market is reflected in the support organizations such as the American Rifleman's Association have given to professional hunting and target shooting interests.

As an example of this significant contribution this industry makes to the labor market, 400,000 people are employed annually with a payroll of $3,528,400,000.

Since this industry includes weapons for defense, and firearms for sports, a wide range of skills are required. These skills range from the factory assembly worker to the research scientist.

PRODUCTION JOBS

- Tool and Die Maker
- Riveter
- Welder
- Painter
- Pattern Maker
- Molder
- Sheet Metal Worker
- Stretch Press Operator
- Power Brake Operator
- Punch Press Operator
- Machinist
- Assembler
- Installer
- Mechanic

Many jobs are available in the firearms industry when the economy is healthy and expanding or when the country is threatened by war or involved in it. At these times, jobs are easily obtained and promotions are more readily available. However, many of the jobs will require a specific level of skill and on-the-job training is needed for advancement and/or promotion. Typical jobs, in addition to those above are:

- Gunsmith
- Firearms Designer
- Ordnance Engineer
- Machine Tool Operators
- Setup and Layout Workers
- Reamer-Rifle Machine Operator
- Barrel Rifler
- Barrel Finisher
- Barrel Inspector
- Arms Service Inspector
- Barrel Lapper
- Subassemblers
- Barrel Operator
- Targeteer
- Proof Technicians
- Cronograph Operator
- Wood-Working Machine Setup Operators
- Proof Inspector
- Clerical Accountants
- Administrators

To get a better idea as to the types of jobs that are available, a visit to a local manufacturing company should be very informative. The visit could also help the student become aware of other jobs that are available in this occupational field.

Students are also welcomed by professional organizations as guests. These visits can help a student become acquainted with various representatives of local industries that manufacture ordnance and accessories.

EXPECTED WORKING CONDITIONS

The industry is dependent on the fluctuations of our economy but has prestige and good wages. The factories are usually clean, many with outdoor job requirements. However, some factories have high noise level areas but measures are usually taken to protect the worker from excessive noise.

Safety is of utmost importance in these factories making it mandatory to follow all listed safety rules. All employees are required to wear safety glasses and clothing and to practice safety procedures at all times.

Fringe benefits usually include vacations, life insurance programs, hospitalization, medical/surgical insurance, sickness and accident insurance, and worker retirement plans.

Many of the ordnance and accessories manufacturing plants have active unions that can represent the worker in company employment agreements.

There are also some jobs that are classified by the military or federal authorities and therefore require a security clearance.

THE FUTURE OF THE INDUSTRY

High level production in this industry is dependent on military and space programs. With the country at peace and no major space programs being planned, production and employment is usually reduced to a lower level of operation.

Since this industry's products are complex and changing, scientists, engineers, and technicians represent a larger proportion of total employment than in most other manufacturing industries. The proportion is expected to increase in the future.

FOOD AND KINDRED PRODUCTS

DESCRIPTION OF THE INDUSTRY

The food and kindred products manufacturing industies are engaged in the manufacture, processing and packaging of food and beverages for human consumption.

Not only must these industries give prime consideration to the safe and nutritional value of their products, but competitive marketing of the products require that the products be attractive and convenient for consumption and distribution by the merchant.

Examples of food and kindred product industries are:

1. Processing of meat and dairy products;
2. Canned or frozen vegetables;
3. Fruits and juices;
4. Bakery and candy products;
5. All kinds of beverages such as soft drinks, beer and wine;
6. Miscellaneous food products.

TYPES OF PRODUCTS

The following categories of food and kindred products are included in the industry:

1. Meat Products - beef, pork, lamb, poultry and processed meat products.

2. Dairy Products - milk, butter, ice cream, cheese and yogurt.

3. Processed Foods - fresh, canned and frozen fruits, vegetables and seafood.

4. Grain Products - processed milk products of cereals and flour.

5. Bakery Products - bread, pastry, cookies, cakes, rolls and pie.

6. Sugar - dry (granulated or powdered), liquid or cubed.

7. Confectionary Products - candy.

8. Beverages - soft drinks, liquor, wine, beer and spring water.

9. Miscellaneous Food Products - oils and fats (vegetable, cottonseed, animal), coffee, shortening, macaroni products, manufactured ice, instant puddings.

IMPORTANCE

The importance of the food and kindred product industry cannot be overemphasized. A foremost concern of every nation in the world is that of feeding its population.

Income level is one of the decisive factors determining the per capita consumption of food, both quantitatively (calorie intake) and qualitatively (variety and nutrition of foods such as meat, dairy products, vegetables and fruits).

In the United States, most families use a large percentage of their incomes for food and beverages. This percentage ranges from 15 percent for higher income families to 50 percent for lower income families. This results in a large market for this industry since the consumption of food and liquid is a continuous process for human survival.

Because of the continuous demand for food and beverage, more than 1.6 million people are employed in the industry. They have a combined total income of more than $10 billion dollars yearly. The beverage industries employ over 220,000 of this total.

Reasons for the growth of this industry other than that of survival are:

1. Development of new technologies such as refrigeration and processing equipment;

2. Dynamic research;

3. Development of new products and processes;

4. Aggressive advertising and promotion;

5. Scientific methods of processing and packaging;

6. Rapid transportation systems with related refrigeration systems; and,

7. Successful control of micro-organisms and chemical changes in food products that permits greater convenience, a greater variety in nutrition, preservation and enhancement of color and taste, provide for economy, as well as

8. Preservation techniques using cold storage, canning, freezing, freeze-drying, curing, use of antibiotics and ultraviolet rays.

Food and beverage manufacturing establishments tend to be located near agricultural sources except for many soft drink bottling establishments. Some of the major locations by category are:

Freezing of fruits and vegetables	Florida and California
Canning Operations	California, New York, Florida
Meat products	East North Central States, West North Central States, Pacific States
Meat Packing	South
Poultry processing	South Atlantic States, West North Central States
Grain Mill Products	Midwestern States
Bread and Related Products	Middle Atlantic States, East North Central States
Confectionary Products	Middle Atlantic States, East North Central States

TYPICAL JOBS

Most production jobs in the manufacture or processing of food and kindred products are for machine operators. Persons with technical training are likely to have a distinct edge in this field. However, lower level jobs are available through on-the-job training.

General categories of occupations included in the food and beverage industry are:

Marketing	Manufacturing
Engineering	Purchasing
Finance	Packaging
Research and Development	

Typical jobs in the food freezing and canning establishments are:

Hand Sorters	Machine Trimming or Peeling Operators
Hand Peelers	Machine Cooking or Processing Operators
Hand Feeders	Canning or Packaging Equipment Operators

The meat packing operations rely on automated equipment for processing meats but rely on hand operations for the preparation and packing of fresh meats. It also requires exceptionally clean operations which therefore makes available positions for specially trained "sanitors."

Another need in the meat packing industry is for trained maintenance personnel, since much use is made of critically needed automated equipment.

Other typical jobs in this industry are:

Production Line Worker
Machine Operator
Inspector
Technician
Marketing Representatives
Production Supervisor
Production Manager
Accountant
Personnel Administrator

EXPECTED WORKING CONDITIONS

Working conditions in the food and kindred product industries vary according to the operations. Some of these are:

Production Jobs	Can be repetitive. Many must wear safety glasses and protective garments.
Hand Operations	Require special dexterity to avoid spoilages.
Machine Operations	Work environment varies. Demands on machine used.
Fruit Processes	Can be seasonal, differs work break routines over the seasons.

Other jobs require food handbook health certificates and some require physical strength and manual dexterity.

THE FUTURE OF THE INDUSTRY

It is expected that the overall employment in the food and kindred product industry will decline among the production or unskilled workers, but should show growth in the food and beverage manufacturing and processing industries in the next decade.

The decline in non-skilled jobs is the result of automation and improved technology. This fact, combined with continuing emphasis on marketing, research, development and pollution control, indicates a growing need for professional and technical personnel.

Other projects for the future are:

1. More competition from imports such as candy and meats;
2. Increased demands for hamburger and processed meats;
3. Greater demand for proportioned packaging to meet the needs of franchised food service establishments;
4. More opportunities for the employment of minority groups; and,
5. More demand for female employees in the processing of fruits, vegetables, confectionary and meat products.

TOBACCO PROCESSORS

DESCRIPTION OF THE INDUSTRY

The tobacco products manufacturing industry is concerned with two major processes. They are:

1. The stemming and redrying of tobacco.
2. The conversion of the dried tobacco leaf into forms that are convenient for use by the consumer and for the dispensing by the merchant.

These products include a variety of tobaccos for chewing, pipesmoking, and snuff as well as several sizes and shapes of cigarettes, cigars, and cigarillos.

TYPES OF PRODUCTS

Factories in this major category are engaged in the manufacture of the following categories of products:

Cigarettes	Cigars	Chewing Tobacco
Filter	Cigarillos	Pipesmoking Tobacco
Non-Filter		Snuff

IMPORTANCE

The manufacture of tobacco products has been an important industry to this country since the days of early colonists in America. It has been especially significant in the economics of Virginia, Maryland, North Carolina, Kentucky and Tennessee.

The Indians of North and South America cultivated and used tobacco much as it is used today. They believed it had medicinal properties. It was introduced to Europe primarily for this reason. Tobacco growth in the colonies soon proved to be the product in greatest demand as a commodity of exchange for articles manufactured in Europe.

Tobacco has long been a major source of revenue, not only in the United States, but in other countries as well. The government derives a much greater income from taxes on manufactured tobacco products, especially cigarettes, than the income derived by farmers from sales of the crop.

Taxes on tobacco products are also imposed by state and municipal governments. Approximately 45-50 per cent of the price paid by consumers is now accounted for by taxes.

Consumption of tobacco products showed a marked decline in 1953-63 and again in 1966, following the release of medical reports linking smoking to lung cancer and certain other respiratory conditions. However, per capita consumption increased again one to two years later but sales of cigarettes have not experienced a marked decline regardless of the warnings on all packages and a ban on television and radio advertising of these products.

Approximately 75,000 people are employed by this group of industries with 8,000 in administration and ancillary services. These employees earn approximately $377 million dollars in combined salaries every year while the value of shipments is almost five billion dollars annually.

Factories engaged in the manufacture of tobacco products are located primarily in the South Atlantic, Middle Atlantic and East South Central States.

TYPICAL JOBS

Cigarette factories are largely automated while only some of the cigar manufacturing industry operations are automated. A number of hand operations are still carried out, especially for higher quality, higher priced cigars.

Tobacco processing offers the normal range of production jobs found in highly automated industries including the auxiliary and support services of marketing, accounting and personnel administration. Jobs range from the unskilled to the supervisory. However, there are two important points about jobs in the tobacco industry that should be mentioned. They are:

1. Production is so highly automated, many of the jobs tend to be of the "inspection" type. These jobs require alertness despite the routine and repetitive operations involved in the manufacturing processes.

2. Blended tobacco mixtures and special operations in the various companies that manufacture tobacco products are of a proprietary nature. This proprietary factor required the production personnel to be conscious of security matters.

The industry also conducts research and development programs due to the agencies such as the United States Surgeon General and the American Cancer Society. The research has provided a variety of opportunities for people with the appropriate experience and training, but often, a master's degree in educational preparation is a requirement.

EXPECTED WORKING CONDITIONS

Some of the working conditions that may be expected in the tobacco industry are:

1. Factories are well lighted, well ventilated, and very often air conditioned.

2. Jobs tend to be repetitive in operations.

3. Wages tend to be lower.

4. Employment is generally on a twelve month basis.

5. Noise levels may be high - but protective gear is provided.

6. There is considerable team work activities.

7. There are many jobs for the handicapped.

THE FUTURE OF THE INDUSTRY

The number of people employed by factories in this group is declining because of automation. Employment will be stronger in cigar manufacturing than in cigarette manufacture, but even here the rate of new employment will be slow. Most jobs become available as replacement for workers leaving the field. Other factors are:

1. Approximately one-third of the employees in this group of industries are women.

2. Minority groups are able to find employment when jobs are available.

3. Employment for scientific and technical personnel is more readily available.

4. There is more job availability for machine mechanics and machine adjusters.

5. Exports remain strong.

6. Tobacco companies are diversifying their products to include items such as foods, beverages, cosmetics and clothing.

Consideration of these factors and the fact that many companies have cropped the word "tobacco" from their corporate names, indicates that the future of this industry is dependent upon their diversification.

TEXTILE MILL PRODUCTS

DESCRIPTION OF THE INDUSTRY

The textile manufacturing industry begins with natural and synthetic fibers. About one-half of the fiber used in this industry is cotton, with synthetic fibers slightly less than cotton in volume.

Yarn is produced from these natural and synthetic fibers. A wide variety of cloth products is then manufactured from the yarn.

TYPES OF PRODUCTS

Major groups of products developed in the textile industry are used by other industries engaged in performing the following operations:

1. Preparation of fiber to manufacture yarn, thread, braids, twine and cordage.

2. Manufacturing of broad woven fabric, narrow woven fabric, knit fabric and carpets and rugs from yarn.

3. Dyeing and finishing of fiber, yarn, fabric and knit apparel.

4. Treating fabric with coating and waterproofing.

5. Custom manufacture of knit apparel and other finished articles from yarn; and

6. Miscellaneous manufacture of felt goods, lace goods, bonded fiber fabrics and other textiles.

IMPORTANCE

The importance of the textile industry to this country cannot be over-estimated. Textiles are produced in about 7,500 mills located in forty-seven states.

Approximately one million people are employed in the textile mills. (If the textile and clothing industries are combined, they employ more people than any other manufacturing industry, within all fifty states and with a total annual payroll of about eleven billion dollars.)

Other statistical factors illustrating the significance of this industry are:

1. Sales of goods produced by the textile industry are usually over $22 billion dollars a year.

2. The textile industry consumes about 9.4 billion pounds of fibers annually.

3. The industry produces about 17 billion square yards of fabric each year.

Percentage consumer use of fabrics are: apparel, 37%; home furnishings, 30%; industrial fabrics, 18%; other consumer purposes, 12% and exports, 3%.

Another important factor to consider is that while there are textile manufacturing plants in almost every state, recent trends indicate a concentration in the Southeast (The Carolinas, Georgia, and Alabama). At the present time, 65% of the textile plants are in the Southeast, 15% in the Middle Atlantic area, with the balance located in other states.

TYPICAL JOBS

The textile industry requires trained personnel ranging from the unskilled to the professional, scientific and upper management. These are categorized as follows:

1. In production processes, spinners, weavers, managers, machinery installers, inspectors, computer operators are needed; and

2. In professional and semi-skilled jobs, clerical workers, supervisors and engineers are needed.

The personnel, as partially listed above, are employed in the process of producing textiles to manufacture yarn, cloth and finished fabrics.

Manufacturing processes used to transform yarn into cloth are many. Some of the most important processes are:

1. Weaving.
2. Knitting such as warping, taschel, tricot and double-knit.
3. Tufting carpets.
4. Chemically or mechanically bonded non-woven textile.

Fabric finishing when needed, includes bleaching, dyeing and sanforizing of the cloth.

With all of the processes and skills involved in the textile industry, a vast number of semi-skilled and unskilled workers are necessary. Additionally, many training opportunities are available due to the vast range of skills that are required.

The textile industry is still growing and new plants are opened each year making chances of advancement relatively high.

The possibilities for lateral career ladders are good but usually require specialized training or retraining. Career advancement is more liberal in this industry at the present time.

EXPECTED WORKING CONDITIONS

Working conditions that you may expect in the textile industry are generally good since the majority of the mills are new. Additionally, management is concerned about the need to maintain good working conditions for productivity, and harmonious labor/management cooperation.

Other factors related to the expected working environment in this industry are:

1. Women comprise about 45% of the total work force.
2. Minority groups are employed in a equal opportunity industry.

3. Earnings are less compared to other types of manufacturing.

4. Jobs in textile mills of the South are more secure since tradition helps management/labor to maintain stability.

5. There are some seasonal jobs available in the unskilled category.

THE FUTURE OF THE INDUSTRY

The most recent reliable statistics indicate continued growth in the manufacture of textile products in this country. However, fluctuation due to general business trends have slowed the customary growth rate.

Other significant factors that affect the future of this industry are:

1. Foreign competition is highly competitive to U.S.A. (especially in wearing apparel).

2. Increased use of technology (computers).

3. Population decrease creates lower demand for textile products; and

4. Increasing industrialization in the Southwestern States could mean more competition for production workers, usually employed in textile industry.

Even with the consideration of the foregoing factors, however, the textile products industry will remain one of the substantial fields of manufacturing in this country.

APPAREL AND OTHER FINISHED FABRIC PRODUCTS

DESCRIPTION OF THE INDUSTRY

The apparel manufacturing industry is composed of those industries involved in the cutting and needle trades. Apparel made from natural and synthetic materials constitute the product of this industry.

These establishments produce clothing or fabricated products by cutting and sewing of purchased materials such as fabrics, leather, rubberized fabrics, plastics, and furs.

TYPES OF PRODUCTS

The apparel manufacturing industry includes the manufacture of the following products:

1. Mens, youths and boys suits, coats, and overcoats;
2. Mens, youths, and boys furnishings, work clothing and allied garments;
3. Womens, misses and juniors outerwear;
4. Womens, misses and infants undergarments;
5. Hats, caps and millinery;
6. Girls, childrens and infants outerwear;
7. Fur goods; and
8. Miscellaneous apparel and accessories.
9. Fabricated textile products:

Curtains	Seat Belts
Bedspreads	Gloves
Blankets	Leather Clothes
Tablecloths	Belts
Awnings	Handkerchiefs
Aprons	

IMPORTANCE

Apparel is one of the products of manufacturing that meets a basic need of mankind. Some statistical data that documents the need for the industry are:

1. Approximately 1.4 million men and women were employed in the apparel industry in 1970 (year that last accurate data was available).
2. About 624,000 were engaged in the production of women and childrens apparel.
3. Approximately 506,000 were engaged in the manufacture of mens apparel.
4. About 92,000 were concerned with the production of fur goods, raincoats, hats, gloves, and dressing gowns.

5. Some 163,000 workers were engaged in the production of curtains and draperies.

Factories are located in nearly every state in the union with the largest concentration in the Middle Atlantic region. About seventy per cent of all establishments are located in the following states:

New York	Tennessee
Pennsylvania	North Carolina
New Jersey	Texas
California	Massachusetts
Georgia	South Carolina

Apparel factories are generally small, employing less than 100 employees in six of seven plants. The larger plants are typically engaged in the manufacture of mens and boys apparel.

Plants that are engaged in the production of apparel that is subject to rapid style change tend to be smaller than the plants that produce standard type garments such as work clothes.

TYPICAL JOBS

Various levels of skill and educational background are required of workers in the apparel industry since apparel represents many types, styles, and grades of garments. Some of the major occupations are centered around the following tasks:

1. Designing the Garment;
2. Cutting the Cloth;
3. Sewing Pieces Together; and
4. Pressing the Assembled Garments.

High-grade and style-oriented garments generally require more handwork and fewer machine operations because of their custom design features.

The major occupational groups for the apparel industry include:

1. Design Occupations

   a. Designers create original designs and new types and styles of apparel and usually are engaged in specialties such as working with one type of apparel.

   b. Sample stitchers prepare the sample garments by following the designer's sketch and performing all the machine and hand sewing operations.

c. Patternmakers construct a full-size pattern of the garment when the sample garment or sketch has been approved.

d. The pattern grader makes a large range of sizes in each garment style (specialized draftsmen).

2. Cutting Room Occupations (including preparing cloth for sewing into articles of apparel)

a. Hand spreaders layout neat bolts of cloth into exact lengths on the cutting boards.

b. Machine spreaders layout the cloth evenly back and forth aided by machines.

c. Markers trace the fiber-board pattern pieces on large sheets of paper.

d. Cutters cutout the various garment pieces from the layers of cloth which are spread on the cutting table by the spreaders.

e. Assemblers bring together and bundle garment pieces and accessories needed to make a complete garment.

3. Sewing Room Occupations (account for almost half of all the apparel workers and are mostly women) Specialized by Operation Performed

a. Garment machine operators make garment sections like pockets and sleeves while others assemble and join the sections.

b. Hand sewers use needle and thread to perform various operations ranging from simple sewing to complex stitching.

c. Inspectors and checkers examine garments for proper workmanship.

d. Trimmers remove loose threads, basting stitches and lint from garments.

EXPECTED WORKING CONDITIONS

Many apparel plants are housed in old buildings where the surroundings and facilities are not as modern as newly constructed plants.

Some of the other conditions that exist in the apparel industry are:

1. Many of the tasks are necessarily repetitive.

2. Pressers find their work strenuous and work with hot steam.

3. Cutting and designing rooms are often in an area removed from the main sewing and pressing operations. Therefore, the conditions may be pleasant and the jobs more interesting and less repetitive.

Conditions associated with wages and other benefits are:

1. Many workers are on piece-work and therefore their income depends on speed and skill.

2. Other workers, such as tailors, patternmakers, graders, inspectors and work distributors, are paid by the hour or week.

3. Most industrial areas are covered by unionization and plants offer benefits to the workers. Some of these benefits are:

Wages	Seniority
Work Hours	Health Insurance
Vacation and Holiday Pay	Pension Plans

It is also noteworthy to know that strikes are rare in the apparel industry. Labor management relationships are stable even though work fluctuation can be expected in special areas because of variation due to the seasonal nature of the garments produced.

THE FUTURE OF THE INDUSTRY

The apparel industry employment is expected to increase moderately during the 1970's. This means that job opportunities are expected from this increase.

It is also important to know that the industry is expected to hire a considerable number of young people because thousands of experienced workers will be leaving the industry. Some factors relating to this aspect are:

1. Eight per cent of the workers are women who may leave each year to marry and/or to raise families.

2. Estimates are that deaths and retirements will provide 75,000 jobs annually.

Another significant factor is that the demand for workers is expected to increase in the future because of general affluence and emphasis upon styling by the industry. However, the increased use of mechanized equipment prevents employment from increasing as rapidly as the demand for apparel increases.

LUMBER AND WOOD PRODUCTS

DESCRIPTION OF THE INDUSTRY

Lumber and wood products manufacturing industries are comprised of a number of complex and highly competitive enterprises. This is the oldest industry in the United States.

Basic manufacturing processes are:

1. Cutting operations in logging camps;
2. Sawing and surfacing operations of the saw mills and planing mills;
3. Manufacture of finished products, as
    a. Packing crates,
    b. Cabinets for Installation,
    c. Flooring, and
    d. Prefabricated portable buildings (excluding furniture).

TYPES OF PRODUCTS

Included in this major group are the following types of establishments:

1. Logging camps and logging contractors (lumber or pulpwood cutting operations, and the production of rough hewn materials such as logs, poles or posts);
2. Saw mills and planing mills, for
    a. Rough lumber,
    b. Planed lumber, and
    c. Flooring and hardwood dimension lumber.

3. Millwork, veneer, plywood, and prefabricated work products;

4. Wooden containers, for

   a. Boxes,
   b. Crates,
   c. Barrels, and
   d. Plywood containers.

5. Miscellaneous wood products, as

   a. Treated wood (to resist decay or fire),
   b. Cork products,
   c. Particleboard,
   d. Clothespins, and
   e. Toothpicks.

IMPORTANCE

The United States is the world's largest consumer of lumber and ranks among the world's greatest producers of it as well. Therefore, it is significant to consider when considering the lumber and wood products industry as a career these factors:

1. Vastness of the industry that has

   a. More than one-half million people employed in the industry in the United States,

   b. Payrolls to employees that reach almost three billion dollars, and

   c. Shipments from establishments that exceed eleven billion dollars.

2. Producers of supplies for other key industries in

   a. Construction,
   b. Paper Manufacturing,
   c. Furniture,
   d. Cellulose Products, and
   e. Naval Stores.

   (NOTE: Because of the direct relationships, related industries have developed programs of silviculture [tree-farming to assist in the effort of timber conservation].)

3. Natural disasters such as fires affect the supply of timber.

4. Environmental policies that

   a. Affects growth and profit margins,

   b. A rise over clear-cutting practices where soil erosion and denuding of foliage has resulted, and

   c. Has influenced improvement of management policies for more efficient utilization, control of fires, and more effective reduction of soil erosion.

5. Concentration of industry is mostly in:

   a. Pacific Northwest,
   b. Rocky Mountains, and
   c. Southeast.

TYPICAL JOBS

The lumber and wood products industry offers a varied job categorization requiring different levels of training and skills. The most important of these are:

1. Timber Cutting Operations that offer opportunities for advancement through on-the-job training and experience for jobs as a

   a. Bucker - remove branches from fallen trees and cut trunks into specified lengths.

   b. High Climber - (in tall timber category) tops trees and removes interfering branches before tree is cut.

   c. Faller - work in teams of two to cut down trees after determining the direction in which the tree should fall.

   d. Logger - moves timber with a tractor and cable system.

   e. Cruiser - identifies the trees to be cut according to specifications.

   f. Manager - supervisor, superintendent.

2. Sawmill operations, include

   a. Pond Worker - load logs.

   b. Deck Worker - help roll logs to carriage.

   c. Deck Sawyer - operate deck saws.

   d. Head Sawyer - operate the sawing of logs.

   e. Block Setters - turn and adjust logs.

   f. Edger - edge logs.

   g. Trimmer - trim away defects.

   h. Sorters - remove boards and stack according to size.

   i. Markers or Graders - grades lumber for commercial sales.

   j. Stackers - inventories and stacks lumber in yard.

   k. Lumber Yard Managers - supervisor lumber retail yard.

3. Skilled occupations of woodworking (follow the pattern in apprenticeable manufacturing establishments).

   a. Advancement based primarily on seniority.
   b. Demand is greater for unskilled workers.

EXPECTED WORKING CONDITIONS

Working conditions vary considerably within this group of industries. Some of the basic physical requirements are:

1. Physical examinations (limits handicapped workers);

2. Good eyesight;

3. Manual dexterity;

4. Surefooted;

5. Have no respiratory problems.

Other conditions in this industry are:

1. Eight-hour work day;

2. Twelve months per year employment;

3. Employees receive sick leave, vacation, and specified holiday time;

4. Many unskilled worker opportunities;

5. Salaries in cutting operations comparable to other manufacturing industries; and

6. Salaries in woodworking factories are generally lower than other manufacturing industries.

THE FUTURE OF THE INDUSTRY

Projections for the lumber and wood products manufacturing industries indicate moderate growth during the early 1970's. However, growth will not be evenly distributed throughout the various industries. Some situational outlooks are:

1. Cutting operations are dependent on timber available and will, therefore, evidence less growth than other types of establishments.

2. Plywood and particle board production should increase, however, it is dependent on the availability of mortgage money and economic patterns to stimulate construction. (Also used in cabinet work that is related to new construction)

3. Increase in employment is expected in sawmills and planing mills.

Overall, the employment opportunities in the lumber and wood product manufacturing industries tend to be decreasing.

FURNITURE AND FIXTURES

DESCRIPTION OF THE INDUSTRY

The furniture and fixtures manufacturing industries use as their raw materials the products of the wood, textile, and metal processing industries, and from these materials, the furniture and fixtures industries manufacture the following products:

1. Household Furniture,
2. Office Furniture,
3. Furniture for Public Buildings,
4. Shelving,
5. Fixtures for Offices and Stores.

TYPES OF PRODUCTS

The following categories of furniture and fixtures are in this major group of manufactured products:

1. Wood Household Furniture; upholstered and non-upholstered.

2. Metal Household Furniture; couches, sofabeds, mattresses and bedsprings, wicker and rattan furniture.

3. Metal Office Furniture; padded and plain.

4. Furniture for Public Buildings; schools, theaters, churches, libraries.

5. Wood and Metal Partitions; shelving, lockers and showcases.

6. Miscellaneous Products; venetian blinds, shades and restaurant furniture.

IMPORTANCE

Furniture manufacture is a craft trade with a long and interesting history. The early Egyptians were pioneers in the upholstering of furniture, and since then every culture has developed many styles of furniture. These styles may vary by region and change through time. The history of a culture can be traced in changing styles of furniture, for it will be possible to identify periods of austerity, prosperity or national stability.

Some establishments engage in the mass production of furniture and may specialize in one product. As a rule, however, mass production techniques have not been particularly satisfactory for these manufacturers, particularly when the manufacture of fine furniture requires considerable handwork to add beauty and durability. Solid wood is traditionally associated with the manufacture of fine furniture. Some of these woods are: mahogany, walnut, cherry, maple and oak.

The upholstering of furniture is largely a handicraft requiring trained and experienced craftsmen. For this reason, the average furniture factory has fewer than 100 employees. Furniture is

required by individuals and business establishments and a status symbol can be established on the basis of the quality of furniture that is used.

Factors related to this industry are:

1. Over 425,000 workers are employed;
2. Nearly 5,000 are in administrative and auxiliary services;
3. Salaries exceed $2 billion dollars per year; and
4. Annual shipments are near $8 billion dollars.

Locations of major establishments in this industry are:

1. Middle Atlantic States,
2. South Atlantic States,
3. East North Central States, and
4. Pacific States.

TYPICAL JOBS

Most occupations in the furniture manufacturing industries do not require a high school diploma since beginners usually learn on-the-job, with some occupations as those in furniture assembly needing only a few days training. Other jobs, such as cabinet-maker, may require four to six years of training, but salaries, prestige and advancement opportunities are usually commensurate with training.

Some occupational categories in the manufacture of upholstered furniture are:

1. Frame Manufacture; Machine Room Operators and Assemblers.
2. Finishing Department; Hand Sanders and Finishers.
3. Springing Department; Springers.
4. Cutting and Sewing Department; Cutters who cut fabrics according to prepared patterns; Operators who use machines to sew covers together.
5. Cushion Department; Fabricator who prepares the fillings. Cushion Fillers who put filling into fabric casing.
6. Upholstery Department; This may be done by one man, or it may be divided into specialties such as seats, arms and backs. Trimmers who add outside fabrics, trim or fringes.

Opportunities in the industry depends on:

1. Size of the shop,
2. Area or location of the shop, and
3. Ability of the individual.

Advancements are possible to positions of:

1. Foreman of a department,
2. Inspector, and
3. Expediter.

There are possibilities for individuals to learn plant operations and skills in a factory and then open private businesses. Some possibilities are:

1. Furniture repair,
2. Upholstery,
3. Refinishing.

EXPECTED WORKING CONDITIONS

Conditions in the furniture manufacturing industry for workers are:

1. Wages tend to be lower than other industries,
2. Salaries for the highly skilled are competitive,
3. Factories are modern and well lighted,
4. Factory air is free of dust and fumes,
5. Workers stand or move about,
6. Workers use brushes, hand tools, and power tools,
7. Factories are noisy,
8. Worker must maintain clean work areas,
9. Worker may need good physical stamina due to stooping, stretching and bending.
10. Disabled persons may be employed,
11. Employment opportunities are available for minorities and women, and
12. Layoffs may occur due to production level fluctuations.

THE FUTURE OF THE INDUSTRY

The outlook for furniture workers depends on future production trends as well as on technological changes in furniture manufacturing. Examples of new skills are the molding of plastics and laminating wood to metal, with levels of employment projected to be stable through the 1970's.

Most job openings in furniture manufacturing result from transfer, retirement, or death. Yet, the number of people currently in training, especially in the woodworking occupations, appears to be somewhat less than the number required for replacements.

Profits in these industries are declining and imports currently exceed exports. These factors increase the difficulty of projecting future employment opportunities, although regional furniture manufacturers associations are very helpful in locating job openings in other businesses that can use trained personnel for:

1. Furniture Wholesaling,
2. Furniture Retailing,
3. Furniture Repair, and
4. Refinishing Shops.

PAPER AND ALLIED INDUSTRIES

DESCRIPTION OF THE INDUSTRY

The paper manufacturing industry includes all the processes required to produce paper or paper products from wood, reused fibers or other raw materials. Pulp, paper and paperboard are the major products of the paper manufacturing industry.

TYPES OF PRODUCTS

The manufacture of paper products falls into three categories. These categories are used by every paper manufacturing plant engaged in one or more of the following activities:

1. The production of pulp from raw materials, usually wood,
2. The manufacture of paper or paperboard from pulp, and
3. The conversion of rolls of paper or paperboard into a variety of finished products, such as paperboard boxes and containers.

IMPORTANCE

Paper and paper products have been described as the most widely used products in this country. Every man, woman and child in the United States uses over five-hundred pounds of paper annually. Each day of our lives all of us have some contact with paper or a paper product.

Some statistical data to stress the importance of paper are:

1. The American paper manufacturing industry produced slightly over 500,000 tons of paper and 550,000 tons of paperboard in 1972.

2. Approximately 710,000 employees are required to produce the paper products we use.

3. One-half of all these employees are employed in the seven states of New York, Pennsylvania, Ohio, Illinois, Wisconsin, Massachusetts, and California.

Another point of importance is that it supports other manufacturing industries which use paper products as expendable items. Others use paper in the manufacture of their own products.

Other important factors are:

1. The United States exports vast quantities of paper to other nations.

2. In 1970, this country exported 2.8 million tons of paper and paper-board valued at $530 million dollars.

3. During the past half century, the production of pulp and paper in the United States has increased by about 850 per cent.

Considering these factors, it is evident that this industry will undoubtedly continue to be a major source of employment for American workers.

TYPICAL JOBS

Before jobs in this industry can be explored, it is necessary to have some knowledge of how paper products are manufactured from pulp which, in turn, is largely derived from wood. The major component of wood that is used in producing paper consists of cellulose fibers that are isolated from other parts of the wood and then rearranged into a desired pattern. Depending upon the end product, it may be done mechanically or chemically.

Pulp produced by mechanical means largely ends up as newsprint. Of the two major chemical processes, one involves sulphite which is noted for its fine texture. The second process, sulphate, produces sulphate paper and is noted for its strength. Sometimes combinations of these methods are used to produce particular types of paper.

The process of paper production is as follows:

1. The logs arrive at a pulp mill by rail, truck, barge, or captive booms.

2. Logs are unloaded by crane operators while a pay loader is used to stack the logs.

3. The logs are dumped into what is called a hot pond, where the bark loosens.

4. Employees called pondworkers maneuver the logs onto a continuous fan conveyor at one end of the pond. (In some mills the logs are slashed or cut into shorter lengths and employees called slashers are in charge of the operation).

Steps in the actual production of paper are:

1. Logs are dropped into a drum debarker which is under control of a debarker operator.

2. The operations are controlled by an electrical panelboard control station.

3. As the logs leave the drum debarker, they are on a conveyor which takes them to the grinding machines.

4. While the logs are on the conveyors, inspectors examine them to insure that sufficient bark has been removed from them.

5. The grinder itself applies water pressure and steam pressure and ultimately results in the wood becoming pulp.

6. A head grinder-operator and other grinder operators control the grinding operations.

7. The screener worker is in charge of processes which further screen the pulp to remove sand, debris, fibers and so on.

8. Bleachworkers control the bleaching and washing operations.

9. Beaters control the process of beating the pulp, a stage which establishes the charactistics of the paper itself and at which point dyes, sizing, alum and other ingredients are added.

10. The color worker or color mixer adds the ingredients to the material.

11. The pulp then is passed through a refiner which causes the bundle of fibers to break up. This causes a more uniform sheet of paper.

12. The refiner operator operates the fiber machine and is in charge of the final cleaning of the pulp.

13. A machine then removes the water from the pulp.

14. A machine tender is in charge of this process.

15. A finisher processes the pulp through dryers to obtain the desired finish or surface on the paper.

16. The calendar operator puts the final finish on the paper.

After a few more stages, the pulp will be in the form of sheets of paper as we know it today.

EXPECTED WORKING CONDITIONS

This industry has many conditions that should be considered. Some of these are:

1. The conditions are noisy, tumultuous, and strenuous;

2. Requires precise attention and tremendous stamina;

3. Most jobs require physical stamina; but

4. There are clerical, accounting and administrative positions available; as well as

5. A fair number of scientific and technical jobs.

6. Other jobs available are: Print Testers, Coating Testers, Laboratory Technicians, Chemists and Biochemists.

7. Many paper mills are in the Northern States.

8. Climatic conditions may range from extremely cold to very hot and humid.

9. Atmospheric work conditions vary depending upon the pulp process used.

10. The sulphate process involves a strong odor (the odor smells like sulphur and comes from the creation of sulphuric acid as wood chips are cooked).

11. Pulp mills are well ventilated and reasonably clean.

THE FUTURE OF THE INDUSTRY

Paper mills are highly mechanized and are slowly becoming automated. This means that a number of operations will be controlled by computers and therefore a number of production jobs will be reduced, although it is expected that gains are expected in output in this industry even though the production will be reduced. Additionally, average hourly earnings in this industry are above the average for manufacturing as a whole.

Employees that will continue to be required are: Chemists, Biochemists, and Laboratory Technicians, jobs that usually require college graduation and some graduate work.

Some of the major concerns of the industry are the continuing over cutting of forests which requires a growing emphasis on the need of recycling paper products. But, considering all of the foregoing factors, however, it is unlikely that they will affect employment in this industry.

PRINTING, PUBLISHING AND ALLIED INDUSTRIES

DESCRIPTION OF THE INDUSTRY

The printing and publishing manufacturing industry is engaged in the publication of books, periodicals, and newspapers. It also includes printing by such processes as:

1. Letterpress,
2. Lithography,
3. Gravure, and
4. Screen Process.

Services for the printing trade, such as those listed below, are also included in the industry. They are:

1. Book Binding,

2. Type Setting,
3. Engraving,
4. Photoengraving, and
5. Electrotyping.

TYPES OF PRODUCTS

The printing, publishing and allied industries include many products and services. Some of the most significant are:

1. Products

   a. Newspapers.
   b. Periodicals--magazines, trade journals, comic books.
   c. Books.
   d. Mass publications and pamphlets--catalogs, directories and maps.

2. Services

   a. Commercial Printing,
   b. Lithographic and other non-lithographic products,
   c. Engraving and Plate Painting,
   d. Greeting Card Publishing,
   e. Book Binding and related work,
   f. Typesetting,
   g. Photoengraving,
   h. Electrotyping, and
   i. Stereotyping.

IMPORTANCE

The best way to stress the importance of the printing, publishing and allied industries is to list some very significant statistical data relative to these products and services.

1. The average American reads between 10,000 and 20,000 words per day (Alvin Toffler, Future Shock).

2. The average citizen is exposed to a minimum of 560 advertising messages per day.

3. Approximately 37,700 book titles were issued in the United States alone in 1971 (From Publishers Weekly). NOTE: This does not include government publications or pamphlets of less than 49 pages.

4. There was a rise in new books of almost 6 per cent last year over the preceding year.

5. In 1970, the total volume of books sold was $2,924,340,000 (estimated by Publishers Weekly) and was expected to rise in 1971.

6. There are nearly 100,000 titles listed in paperback books currently in print. (The Directory of Paperback Books In Print).

It should be noted that the foregoing statistics deal with only one example of books. In addition, each year millions of copies of magazines, trade journals and newspapers are produced.

The Writer's Market, a book published as a directory for free lance writers, runs to over 700 pages and lists 4,897 different kinds of writer's outlets. They include over 1,200 major book publishers, greeting card publishers, magazine publishers, and newspaper syndicates.

It is expected that this situation will increase both in size and complexity, despite the fact that modern technology is consistently involved in a search for ways to replace the printed word. The consensus at this time seems to be that the printed word may be "supplemented" or, in some instances, be replaced. However, it will continue to have a growing role in our daily lives.

TYPICAL JOBS

Jobs in publishing and printing are so varied that they can only be described in the broadest terms. They range from the position of editorial assistant to the person who makes a record of a subscription order. The jobs in this industry fit into two broad categories:

1. People involved in the preparation of manuscripts for publication. An example is:

   First readers of manuscripts
   to
   Copy Editors
   to
   Proofreaders

2. People who take the typewritten manuscript through stages; typesetting, proofing, binding, mailing.

The jobs in this industry are changing due to several reasons, such as:

1. The development of offset printing;

2. Mass production of paperbooks due to adhesive binding;
3. Color typesetting development;
4. Photocomposition of books;
5. Advances in the fidelity of mass-produced color illustrations; and
6. Advances in computer technology.

In the future, therefore, it may be that computer operators will be of greater importance than typesetters. Presently, however, traditional jobs still exist in this industry that provide typical career ladders, some of which are suggested to provide the student with a future reference.

1. Publishing Company:

Editorial Assistant (usually a college graduate)
Assistant Editor
Associate Editor
Senior Editor
Copy Editor
Executive Editor
Managing Editor
Editorial Director of a Division
Editor-In-Chief

2. Printing (or Publishing) Company:

Trainee (any of the trades listed above)
Apprentice
Skilled Tradesman
Foreman or Shift Supervisor

It is also important to mention that terminations among publications in America have been high. Some that have disappeared are:

Life	Woman's Home Companion
Look	Colliers
Saturday Evening Post	American Magazine

Authorities in the magazine industry say that these publications have been replaced by specialized publications. These newer publications, however, do not offer the mass employment possibilities of their predecessors. As an additional example, fifty years ago New York City had nineteen daily newspapers, today there are only two or three.

The printing and publishing industry as a whole is expanding. It is doing so in highly specialized ways and the traditional opportunities for employees may no longer exist because the publications and outlets which are replacing mass market types may well require more specialized skills and perhaps greater competency in areas of specialty. Thus, there will be better oppor-

tunities in this industry for the person who is willing to spend the time to acquire a very high level of competency. Promotional opportunities will also remain high for the individual with this kind of background.

EXPECTED WORKING CONDITIONS

Conditions that are expected in printing, lithographing and related areas are as follows:

1. The companies usually work with collective bargaining units
2. Hourly earnings are at a good level
3. Benefits are negotiated regularly with the company
4. Strikes may be frequent and usually result in increased earnings
5. Because of the disappearance of major publications in certain cities, there are many high seniority workers looking for employment
6. Recently, large scale printing activities have concentrated in certain geographical centers (such as Dayton, Ohio)
7. Cities in Tennessee and New England have become headquarters for book production
8. In recent years, printing of advertising materials, catalogs, and other specialized material has expanded.

Small print shops and printing services tend to be non-unionized but wages still remain at a high level due to competition.

Some of the conditions related to editorial positions are:

1. Beginning salaries tend to be low at first.
2. Positions are prestigious.
3. Positions offer broad and varied business/professional contacts.
4. Jobs provide more than routine day-to-day challenges.
5. A disadvantage is the large number of applicants every year who compete for establishment in the business.

THE FUTURE OF THE INDUSTRY

A continued rise in printed materials is anticipated throughout the 1970's because of the following reasons:

1. Greater reliance on the printed word for dissemination of information;
2. Increasing level of education;
3. Population growth; and
4. General expansion of American industry.

The expected increase in printed materials is likely to expand the employment opportunities in the editorial processing of various types of information and materials, while a continued trend toward consolidation of book publishing houses, magazines and newspapers would mean that job opportunities in this field will continue to exist with smaller specialized companies.

Employment in the skills printing trades is not expected to show a significant rise because of the introduction of technological changes in printing methods. This will also affect other major areas such as:

1. Type composition,
2. Plate making, and
3. Bindery operations.

A large segment of the people employed in publishing and printing are printing craftsmen. The skills they acquire are highly specialized in both printing operation (type composition, photography, plate making, press work or binding) and basic printing method (letterpress, lithography or gravure), but extreme specialization may make it very difficult for the individual to transfer.

Considering all of the foregoing factors, there will continue to be demand for people in all publishing and printing fields even beyond normal attrition, and with more than half the nation's printing employees located in New York, Illinois, California, Pennsylvania and Ohio, employment in these areas is not expected to change in the forseeable future since these states are also major centers for other industries and financial institutions.

CHEMICALS AND ALLIED PRODUCTS

DESCRIPTION OF THE INDUSTRY

The chemical manufacturing industry takes organic or inorganic raw materials and refines or converts them into usable products. These products then become "raw" materials to be utilized by other industries.

TYPES OF PRODUCTS

Chemical products used in this industry are typically categorized in three ways:

1. Process Chemicals
    a. Acids
    b. Solvents
    c. Catalysts
2. Raw Materials
    a. Food additives
    b. Paint components
    c. Dyes
3. Finished products (to be used by other industries and the public in their chemically produced state)
    a. Fuels
    b. Fertilizer
    c. Drugs

IMPORTANCE

Chemical products are used by industry and people every day. It is difficult to think of any activity that does not require the use of some chemical product, particularly in industries since they use additives required to manufacture other products.

Some statistical data to stress the importance of this industry are:

1. Approximately 545,000 workers are employed in the chemical manufacturing industry.
2. There are about 3,000 plants in the United States.
3. Chemical plants are usually close to industrial centers.

4. Special plants that produce chemicals made from petroleum and natural gas are located near the oil fields and refineries in California, Louisiana, and Texas.

5. While chemical manufacturing workers are employed in almost every state, nearly two-thirds of them are located in the following ten states:

Delaware	Pennsylvania
Michigan	Tennessee
New Jersey	Texas
New York	Virginia
Ohio	West Virginia

TYPICAL JOBS

Many different skill levels and education are represented in the one-half million people who work in the chemical manufacturing industry.

These jobs are divided into three categories:

1. Plant Occupations - Three out of every five employees in the chemical industry are engaged in plant occupations separated into three groups:

   Processing workers
   Maintenance workers
   Other Plant workers

2. Scientific and Technical Occupations - The chemical manufacturing industries comprise the country's largest employers of scientific and technical personnel. One of every six workers is employed as a scientist, engineer, or technician.

3. Administrative, Clerical and Related Occupations - About 25 percent of all employees of the chemical manufacturing industry are secretarial and bookkeepers.

Job opportunities range from unskilled to skilled. However, beyond the plant occupations, specialized training or higher education is required for advancement, in the scientific, technical, and administrative areas, where there are many levels of responsibility and manifold opportunities that lead to career ladders.

EXPECTED WORKING CONDITIONS

Some of the more important working conditions in the chemical manufacturing industries are as follows:

1. The largest group of employees are skilled and, therefore, earn relatively high-average salaries.

2. Beginning salaries for inexperienced chemists and chemical engineers are among the highest in any industry.

3. Employees receive paid vacations, pension plans and insurance coverage.

4. The industry is not seasonal and requires year-round employment.

5. Most plants operate 24-hours a day, 7 days a week, which results in overtime for many employees.

6. Companies have ventilating systems or air-conditioning because of the disagreeable odors and high temperatures that exist.

7. Employees near dangerous work stations wear protective clothing and special eyeglasses.

THE FUTURE OF THE INDUSTRY

Employment in the chemical manufacturing industry is expected to increase slowly during the next ten years, even though production of chemical products will increase rapidly.

The largest growth will be in the professional, technical, and administration areas. Emphasis on research will require more chemists, engineers, technicians and related personnel. In addition, automation and the increase of technology will increase the demand for plant workers such as:

Instrument Repairers
Pipefitters,
Electricians, and
Other Skilled Maintenance workers.

PETROLEUM REFINING AND RELATED INDUSTRIES

DESCRIPTION OF THE INDUSTRY

The petroleum industry begins with rock oil. Rock oil is petroleum that is taken from the rocks of the earth as a gas, a liquid, or a semi-solid. The most prevalent form of petroleum is the liquid, which is called crude oil.

Petroleum gas is termed natural gas and the semi-solid forms of petroleum are called asphalt or pitch.

From these raw materials many of the fuel products used in everyday life are extracted in refineries.

TYPES OF PRODUCTS

Eighty-five percent of all the crude oil processed in this country is used to manufacture fuels, such as:

Gasoline	Diesel Fuel	Fuel Oil	Kerosene
Liquified Gas	Coke	Jet Fuel	

The remaining fifteen percent is used for producing chemical raw materials. These products are called petrochemicals, such as:

Carbon Black	Waxes	Petroleum Jelly
Lubricants	Asphalts	Solvents

The petrochemicals are used as raw materials to manufacture such products as:

Synthetic Rubber	Plastics	Synthetic Fibers
Insecticides	Detergents	Drugs

IMPORTANCE

Each person in the United States uses some type of petroleum product during any typical day.

The petroleum and natural gas industries provide seventy-five percent of all the energy fuels used in this country. Examples are:

1. Nearly all motor vehicles depend on fuels and lubricants produced from crude oil.
2. Homes and businesses rely on oil and gas for heat.

3. More than one-half of all the electric power generated in this country relies on oil or oil and gas.

4. About 153,400 workers are employed in the various activities within the petroleum industry to meet the demand for petroleum products.

5. About 25 percent of all petroleum workers are operators who are involved in the refining process of converting crude oil into usable products.

6. There are about 300 refineries in operation in this country located in almost every state, but ninety percent of all crude oil refining is done in the following ten states of California, New Jersey, Illinois, Ohio, Indiana, Oklahoma, Kansas, Pennsylvania, Louisiana and Texas.

Generally, refineries are established near oil fields, consuming centers or ports where the water is deep enough for oil tankers to dock.

TYPICAL JOBS

Most of the jobs in the manufacturing of petroleum products are in the refineries. New workers are typically used as aides in a labor pool until such time as a vacancy occurs in the processing department or maintenance shop. There is no formal apprenticeship.

For initial employment, refineries typically require a high school or vocational school education in the refineries that usually employ process workers and maintenance workers as:

1. Process workers to convert the crude oil.

2. Maintenance workers to maintain the machines and equipment in working order.

Process workers perform such tasks as:

1. Monitoring instrument readings for changes in temperature, pressure or oil flow.

2. Maintaining and operating pumps which circulate petroleum products, chemicals and water; and

3. Operating equipment that removes impurities from petroleum products.

Included among maintenance workers are:

Skilled Boilermakers	Masons
Carpenters	Painters
Electricians	Pipefitters
Instrument Repairmen	Insulators
Lead Burners	Riggers
Machinists	
Sheet Metal Workers	
Welders	

An unskilled worker usually begins as a helper or trainee in these jobs. Most refineries also employ people in the following positions:

System Analysts	Administrative	Office Personnel
Coders	Management	Secretaries
Programmers	Chemists	Typists
Keypunch Operators	Engineers	File Clerks Clerical

Opportunities for advancement may depend upon advanced skills or seniority whereas supervisory or monitoring jobs require engineering degrees or extensive technical training with the normal career ladders in this industry and chances for promotion better than in numerous other fields since this is an expanding industry.

EXPECTED WORKING CONDITIONS

Most of the jobs in the petroleum industry are located in ninety percent of the approximate 1,800 refineries located in the ten states previously noted, in item number 6, page 64.

Jobs which are available to women, minority groups and the handicapped in this industry, are usually found to be interesting and exciting.

THE FUTURE OF THE INDUSTRY

It is difficult to be specific about the future of the petroleum industry in this country. Factors to consider are:

1. The impact of the Alaska pipeline,
2. The Middle East situation,
3. The demand which may develop for increased domestic oil production, and
4. The utilization of other sources of energy.

Indications are that domestic oil production and processing will expand and employment opportunities in this field will grow, especially for workers with technical background in geology, petroleum engineering and related fields.

RUBBER AND MISCELLANEOUS PLASTICS PRODUCTS

DESCRIPTION OF THE INDUSTRY

The rubber manufacturing industry uses crude rubber, whether natural or synthetic, and mixes it with numerous chemicals and materials to produce thousands of useful products.

The plastics manufacturing industry takes either natural or synthetic resins and molds them into another broad range of products.

TYPES OF PRODUCTS

The rubber manufacturing industry uses natural, synthetic or reclaimed rubber and, through mill mixing and the addition of chemicals, produces standard rubber stock. This standard stock can vary in both hardness and composition, depending upon the product to be manufactured.

Rubber products may be grouped in the following categories:

1. Tires and inner tubes;
2. Tire repair and retreading materials;
3. Rubber footwear;
4. Reclaimed rubber products; and
5. Fabricated rubber products such as footballs, erasers, hoses and rubber tile.

The miscellaneous plastics industry deals primarily with moldable materials manufactured from compounds and resins. Recent emphasis has been upon the production of synthetic resin plastics because of their multiplicity and versatility.

Some of the most widely used plastics are:

Polyethylene	Urea and Melmaine Resins
Vinyls	Coumarone-indene Resins
Styrene Resin	Polyesters
Phenolic Resin	Celluloses
Alkyds	Epoxy Resins

Many useful products are manufactured from these plastics. Some of the most common are:

Dinnerware,	Hoses,
Packing Materials,	Boats and
Pipe and Pipe Fittings,	Window Shields.

IMPORTANCE

The importance of the rubber and the plastics industries cannot be overstated. Some statistical data to emphasize this significance are:

1. Approximately one billion dollars have been expended for new plants and equipment in recent years.

2. There are over 6,000 establishments employing over one-half million people.

3. Each person in the United States uses an average of about 26 pounds of rubber each year.

Important physical characteristics of rubber and plastics are listed to illustrate the versatility of these products. They are:

1. Both can be made hard enough for use as bowling balls or soft enough for pillows and cushions.

2. Some products shed water--protective clothing.

3. Some products absorb water--sponges.

4. Both can be stiff or stretch like rubber bands.

5. Plastics are used as substitutes for steel, wood, paper and other materials.

Additionally, the space age has challenged the plastics industry to develop new materials suitable for withstanding the rigors of space travel. The challenge has been met by the plastics industry which manufacture missile nose cones, rocket motor nozzles, and binders for solid propellants.

TYPICAL JOBS

The rubber and plastic industries utilize a range of workers in the manufacturing process. The workers include those who are:

Managerial,
Technical,
Skilled Crafts,
Semi-Skilled, and
Unskilled.

There are excellent opportunities for the semi-skilled level of workers in the production processes. Advancement is based on seniority since these industries tend to maintain collective bargaining agreements.

Most technical and managerial positions require college degrees. Because there is research and development in these industries, many chemists and engineers are needed.

The rubber and miscellaneous plastics industries will offer reasonably good opportunities for workers to move laterally or advance because of the continued expansion that is expected.

EXPECTED WORKING CONDITIONS

Rubber and plastic manufacturing engage most workers in the production of standard stock or molding into predetermined forms. Some aspects of the conditions of employment are:

1. Assembly line type work needs dexterity.
2. Work may be repetitive but necessary.
3. Noise levels are high, but worker uses protective gear.
4. Normal manufacturing plant environment can be expected.

These establishments are typically located in the large industrial cities of the midwest. Companies that are engaged in manufacturing specific rubber and plastic products are located in most states and included more than 600 cities.

In these industries there are positive efforts to employ handicapped persons, minority group members, and women in new jobs will emerge as production technology, monitoring, and control become more increasingly computerized.

THE FUTURE OF THE INDUSTRY

The most recent data indicates continued growth in rubber and miscellaneous plastics production. The plastics industry particularly is experiencing an increase in demands for new and more versatile products despite foreign competition in the production of plastic products. The outlook, however, is that neither foreign nor domestic production can meet the future needs.

It is difficult to assess the growing opposition to plastics in general by environmental action groups. It remains to be seen what effect this movement will have on the plastics industry.

The most significant point to consider is that rubber and plastics are so versatile in their applications that increasing uses for them undoubtedly will be discovered. Therefore, the rubber and miscellaneous plastic industry may very well prove to be one of the most important and substantial manufacturing fields in the United States in the years ahead.

LEATHER AND LEATHER PRODUCTS

DESCRIPTION OF THE INDUSTRY

The leather and leather products manufacturing industries utilize as their raw materials the hides and skins of animals. Some establishments in this group are concerned with the processing or tanning of animal hides while other establishments utilize the finished leather or simulated leather to manufacture products such as: Industrial Leather Belts, Boots and Shoes, Luggage, Handbags and Dog Collars.

TYPES OF PRODUCTS

Businesses in this major group are engaged in the processing or production of:

1. Leather tanning and finishing;

2. Industrial leather belting;

   Transmission Belting
   Textile Leather

3. Boot and shoe stock;

   Innersoles
   Leather soles and heels
   Wooden heels
   Soles made of rubber, plastic or composition

4. Leather or composition footwear and house slippers;

5. Leather gloves and mittens; and

6. Luggage and other personal goods;

   Handbags,
   Billfolds,
   Coin Purses,
   Saddlery, and
   Embossed Leather Goods.

IMPORTANCE

The curing or processing of various animal hides for use in clothing and footwear is one of man's oldest and most important occupations.

The physical characteristics of leather make it particularly suitable for a number of purposes. They are:

1. It is strong and durable, and under most conditions is resistant to decay.

2. It provides not only protection but also warmth, making it an ideal material for the manufacture of footwear and boots, luggage, gloves and saddlery.

3. Finer quality leather is recognized as a status symbol, especially in car and furniture upholstery.

4. No synthetic product is as satisfactory for footwear as leather.

5. Leather possesses the common physical property of water vapor permeability, which means that it "breathes" or allows vapors to pass through rather than accumulate inside.

Leather and leather products manufacturers employ approximately 330,000 persons in this country. Of this total, approximately 8,000 are employed in administrative and auxillary services.

Other factors that relate to the importance of this industry are:

1. The payroll for all employees in these industries is approaching $1.5 billion dollars.

2. The value of shipments involved exceeds $5 billion dollars annually.

3. The major raw materials are by products of mean consumption. These include cattle and calfskins, goat and kidskins, sheep and lambskins.

4. Other hides and skins in commercial use come from horses, pigs, kangaroos, reptiles, seals and walruses.

Establishments engaged in the manufacture of leather and leather products are most heavily concentrated in the following areas:

New England States
East North Central States
Middle Atlantic States

Another geographic area being included in leather products manufacturing during recent years is the South. The main reasons for this are lower costs in that area and the fact that locations no longer need to be near tanneries due to the development of synthetic materials.

TYPICAL JOBS

Job families in the leather finishing and tanning industries include:

Truckers - Carry hides to storeroom;

Trimmers - Cut away unfit leather and cut cattle hides in half;

Sorters - Classify grades of leather;

Laborers - Load and unload hides from huge washing tanks;

Fleshing Machine Operators - Remove flesh or fat;

Unhairing Machine Operators - Remove hair;

Beamster - Removes remaining hair;

Bark Liquor Operator - Mix tanning solution;

Haulers - Remove from vats;

Staker - Stretch skin for drying to make it soft and supple;

Drying Tunnel Tenders - Stretch hides to dry;

Finishing Machine Operators - Roll and smooth hides;

Hand-Finishers - Rub dressing or paste on leather;

Glazers - Make glossy;

Inspectors - Inspect hides;

Scalers - Weight checking, remove hide scales;

Measuring Machine Operators - Dimension and thickness grading; and

Graders - Catalog for various utility uses.

Jobs in footware manufacturing depend heavily on production because there are 150-200 separate operations in shoe production. These include:

Designer - Designs footwear;

Patternmaker - Makes patterns;

Clicking Machine Operator (or hand cutter) - Cuts the leather singly or in batches from patterns;

Prefitters - Marks stitching;

Skivers - Tapers edges of leather to prevent bulky seams;

Sewers - Machine stitchers;

Fancy Stitchers - Custom, decorative stitching;

Assemblers - Assemble basic shoe parts;

Insolers - Prepare inside shoe materials;

Pulling-Over Machine Operators - Pull leather over lasts and shape it;

(NOTE: Lasting is one of the most important operations; the machinery is complex and it requires great skill.)

Inspectors - Check finish, match rights and lefts of pairs;

Packers - Prepare finished shoes for shipment;

Foremen and Assistant Foremen - Supervise work in each "room" or department;

Sales Manager - And staff, supervisor sales; and

Superintendent and Assistant Superintendent - plant management.

EXPECTED WORKING CONDITIONS

Employees in leather and leather products manufacturing generally work indoors. Some of the factors related to these conditions are:

Tanning and Finishing Operations:

1. Workers are exposed to wet hides and the chemicals used in processing the hides.

2. Manual dexterity is a prerequisite.

3. Ready opportunities for women exist.

4. Factories are usually unionized.

5. Employment is on a twelve-month basis.

6. Employees receive paid vacations.

7. Employees receive sick leave and holidays.

8. There are occasional season fluctuations in processing due to availability of hides.

Manufacture of Boots, Shoes and Slippers:

1. Work is seasonal (especially for women's shoes).

2. The industries are not affected by economic cycles (except for women's shoes).

Leather Products:

1. Many jobs are repetitious.

2. Wages are hourly and lower than in other manufacturing areas.

Overall, except for tanning operations, women find ready employment in these industries. Workers who are highly skilled may find jobs where they may work on piece work or incentive plan for higher wages. There are also good opportunities for custom work, and good craftsmanship, all of which can result in economic advancement.

THE FUTURE OF THE INDUSTRY

Employment in the leather and leather products industries is declining with a few exceptions. Factors that are contributing to this situation are:

1. Supplies of hides and skins are uncertain. Cattle hides are the only ones in plentiful supply domestically.

2. American factories are dependent on foreign sources for varying quantities of calf, sheep, lamb, goat, kid, kangaroo skins, and other exotic skins (reptile and ostrich).

3. Some species of fish and wildlife are now endangered and are protected.

4. Imports of leather and leather products affect these industries. Rough tanned hides, finished leather, footwear and other leather products take a heavy toll in domestic sales.

5. Steadily increasing costs of materials and wages, research, development, and other manufacturing expenses make it difficult for smaller producers to compete with larger firms and with imports. (This has caused mergers or closings in recent years.)

6. Progress toward automation has been slow.

7. The complexities of shoe sizes and widths create a difficult challenge in the design of automated equipment. (Increased automation will improve growth rate but will further reduce the number of workers required.)

8. The government was required to initiate programs to develop jobs for displaced workers, to improve employability of displaced workers, and to provide assistance to firms adversely affected as business declined.

Factors favorable for this industry are:

1. Fashion is one of the major stimulators of sales.

2. Current fashion trends in leather, leather jewelry, boots, shoes, and clothing are providing at least a temporary stimulus in the industry.

The overall employment outlook in this group of manufacturing establishments appears something less than optimistic. However, where employment does exist, the following situations are evident:

1. Skilled workers are in greater demand than unskilled.

2. Leather work specialists are in demand and their talent and willingness to work determines their success and employment tenure.

STONE, CLAY, GLASS AND CONCRETE PRODUCTS

DESCRIPTION OF THE INDUSTRY

The stone, clay, glass and concrete manufacturing industries produce a wide variety of products ranging from flower vases to asbestos insulation.

These industries are concerned with the mining or processing of every non-metallic, inorganic mineral available. Using materials taken principally from the earth in the form of stone, clay and sand, establishments in this group manufacture glass products such as:

Scientific Glassware or Containers
Cement
Structural Clay Products
Pottery
Gypsum Products
Cut Stones
Synthetic Gem Stones

TYPES OF PRODUCTS

Products produced by these industries include:

1. Flat glass containers used for packing and bottling;

2. Pressed and blown glass; decorative glassware, textile glass fibers.

3. Cement; Portland, Natural masonry and Lozzolan cements.

4. Structural Clay; brick, clay tile, clay firebrick, ceramic wall and floor tile, heat resisting clay products and roofing tile.

5. Stuctural Clay Products; sewer pipes.

6. Pottery and Related Products;

   Vitreous China

   Earthenware fittings and bathroom accessories

   Vitreous china table and kitchen articles for use in homes and restaurants for preparation and serving food

Fine earthenware table and kitchen articles for preparing, serving, or storing food and drink

Porcelain electrical supplies

Pottery products

Red earthenware florists articles.

7. Concrete, Gypsum and Plaster Products;

Concrete block and brick

Concrete products

Storage tanks
Ready-mixed concrete

Lime and gypsum products

Plaster and plasterboard.

8. Cut stone and stone products; marble, granite, slate, miscellaneous stones for building and other uses.

9. Abrasive, asbestos and miscellaneous non-metallic mineral products, as:

Abrasive grinding wheels

Asbestos textiles and building materials

Gaskets, packing and asbestos insulations

Minerals and earths for industrial use

Grinding or pulverizing rocks, minerals or slag.

IMPORTANCE

This major group of industries design and develop products that can range from a flower vase to the ceramic nosecone of a missile. It helps meet demands in electronic, atomic energy and space research. In addition, the industries are concerned with the new uses of compounds and their applications for the benefit of man. They are concerned with every non-metallic, inorganic mineral available. Ceramic products are the most heat resistant, most durable and hardest products available to man.

Factors of significance in this industry are:

1. It employs 600,000 employees.
2. The annual payroll is $3,800,000,000.00.
3. Progress in pollution control is excellent.

TYPICAL JOBS

Employment in the stone, glass, and clay industry can be found in the following categories:

1. The mineral industry.
2. Research and development.
3. Plant operations.
4. Sales.
5. Management.
6. Education.
7. Government service.

Occupations concerned with cutting, shaping and finishing granite, slate, marble and other types of stone include:

Stencil cutter for stonework	Hand coper
Stone carver	Miller
Hand stone cutter	Rock splitter
Freestone stone cutter	Slate splitter

Occupations related to hand-made glass products include:

Lay-out man	Glass bender
Glassware finisher	Sprues breaker
Glass blower	Hot-metal worker
Glass technologist	

Occupations in coloring and decorating brick, tile and related products include:

Plaster foreman	Brick and tile pasterer
Brick and tile decorator	Glass products decorator
Brick and tile colorer	

Occupations in fabrication and repair of pottery and porcelain ware include:

Bisque Cleaner	Clay shop supervisor	Jigger or potter
Dipper or glazer	Pattern or model maker	Jollier
Finisher	Pottery or porcelain land presser	Plaster-die maker
Handle sticker	Inspector or selector	Sagger maker
Turner	Decorator inspector	Ware dresser

The jobs listed are usually unionized, which implies promotion through seniority in many instances. Moreover, there is not the turnover in most of these industries that is experienced in many other fields.

There are openings for women and minority groups in these industries which are not widely represented in every region and locality, but appear to be most heavily concentrated in the midwest and in New England.

Automation is increasingly a part of these industries but a wide variety of jobs still exist for career ladder possibilities just as for any heavily unionized group of industries.

EXPECTED WORKING CONDITIONS

These industries are dependent on general economic conditions which depend particularly on the availability of capital for construction. Wages vary depending on geographical location.

A worker in these fields should be able to understand and operate machinery. Other requirements or benefits are:

1. Work is eight hours a day.
2. Work is 40 hours per week.
3. Workers receive benefits such as:

   Paid vacations
   Sick Leave
   Health and life insurance
   Workman's compensation.

4. On-the-job training is available from apprentice to master craftsman except in an assembly line where seniority comes into effect.
5. Coordination, steady hands, and manual dexterity are needed.
6. Much of the working day is spent outside.
7. Work is safe, but caution is required around large machinery.

THE FUTURE OF THE INDUSTRY

These industries depend on the general economy because they also depend directly upon people as consumers of their products.

Indications of high employment in these industries include upsurges in commercial construction, increased housing and an expanding population, all of which require the industry products.

Increased automation and developing technology has not hurt these industries, but has resulted in change of emphasis on skills required. This is a situation which is still in a state of change.

Since these industries are so closely involved with the general state of the economy, up-to-date assessments of this will always provide the best picture of the employment outlook over any five or ten year period.

PRIMARY METAL INDUSTRIES

DESCRIPTION OF THE INDUSTRY

The primary metals manufacturing industry begins with metal ore. The ore is extracted, refined, and converted in the process of manufacturing stock to be used as raw materials for the manufacture of other metals by other industries with iron and steel making up about 90 percent of all such metals produced.

TYPES OF PRODUCTS

Primary metal manufacturing plants are engaged in the production of metals that may be categorized into two major groups:

1. Raw materials (products manufactured from ore for use by industries)

Aluminum	Copper	Titanium
Pig Iron	Magnesium	

2. Alloys (products of the combination of two or more metals)

Bronze	Steel	Brass

The primary metal manufacturing industry typically produces "standard" stock (according to established dimensions). Some are:

Nails	Wire	Pipes
Tubes	Structural Steel	Rails

IMPORTANCE

The primary metals industry is the basis of our industrial society. Some product of the primary metals industry is used in almost every walk of life each day. Other factors to stress the importance of this industry are:

1. Approximately 131 million tons of raw steel are produced annually.

2. United States steel production is one-fifth of the world's steel production.

3. The iron and steel industry is one of the largest employers with 850 plants that employ 630,000 workers in the United States.

The largest part of the iron and steel manufacturing industry is found in the Northern and Eastern states of:

Indiana	Michigan	Maryland
Ohio	New York	Pennsylvania

Other parts of the country have primary metal industries to a lesser degree. Seventy percent of all the industry's workers are employed in the five most important iron and steel manufacturing states. These States are:

Illinois	New York	Pennsylvania
Indiana	Ohio	

TYPICAL JOBS

There are more than 1,000 different types of jobs in the primary metals manufacturing industry. Every level of skill and education is represented.

The many types of jobs in the industry are typically categorized into three groups:

1. Processing Occupations - The operations involved in converting iron ore into steel and then into semi-finished steel products which range from:

   Reducing iron ore to molten iron, to
   Operating machines which produce items
   such as pipe, tubing and template.

   Several hundreds of jobs are included in this range of occupations.

2. Plant Service Occupations

   a. Maintenance Workers - support processing activities by maintaining and repairing equipment as well as operating certain support equipment.

   b. Locomotive Engineers and Train Crews - are required to operate diesel or electric trains for transporting materials and products in the large yards found in the iron and steel plants.

   c. Skilled Operators - required to operate such equipment as boilers, turbines and switchboards.

3. Administrative and Office Occupations - Account for 20 percent of the industry's total employment. It includes engineers, scientists, technicians.

New unskilled workers are usually hired as plant laborers while higher level jobs are filled by promoting workers from lower graded jobs. Length of service has a great deal to do with being promoted since this industry is heavily unionized.

Nearly all the training for processing occupations is done on the job. Advancement is usually along well-defined lines of promotion. However, most of the larger companies have educational and training programs for their employees.

EXPECTED WORKING CONDITIONS

Working conditions in the primary metals industry differ according to occupation. Some aspects are:

1. Administrative and maintenance shops which are generally cool and comfortable.

2. Many plant locations are hot, noisy, and dirty.

3. Some jobs have been improved by the introduction of remote control and air conditioned cabs on machines and equipment.

4. The primary metals manufacturing industries are also among the leaders in the development of safety programs.

Some of the employment benefits included in this industry are paid vacations, full pension benefits after 30 years service, and full insurance and hospitalization.

THE FUTURE OF THE INDUSTRY

Employment in the primary metals industry is expected to decline during the next decade due to advancements in mechanization. These improvements have resulted in increased output per worker. But, there will, however, be a need for workers to replace those who retire or leave for other reasons, and employment is expected to rise in specific occupations of engineering, metallurgy, laboratory technicians, other technical personnel, research and development.

FABRICATED METAL PRODUCTS, EXCEPT ORDNANCE, MACHINERY AND TRANSPORTATION EQUIPMENT

DESCRIPTION OF THE INDUSTRY

The fabricated metals manufacturing industry utilizes "raw" materials produced by the primary metals industry for the fabrication of finished products made of ferrous and nonferrous components.

TYPES OF PRODUCTS

This major group includes establishments engaged in the manufacture of the following production (all of these utilize purchased materials):

1. Metal cans and containers;
2. Cutlery, hand tools, and general hardware;
3. Heating apparatus and plumbing fixtures;
4. Structural metal products;

    Bridges
    Buildings
    Ship Sections
    Boats
    Barges

5. Metal Fasteners;

    Screws
    Bolts and Nuts
    Rivets
    Washers

6. Metals Stampings;

   Tools
   Dies
   Jigs and Fixtures

7. Coating, Engraving, and allied services;

   Electroplating
   Polishing
   Anodizing
   Coloring

8. Miscellaneous Wire Products;

   Nails
   Spikes
   Clothes Hangers

9. Metal Foil and Leaf;

   Aluminum Foil
   Gold Leaf
   Silver Leaf.

IMPORTANCE

The importance of the fabricated metals industry to the United States is obvious as we observe our environment. There is not a home or business that does not depend daily on a great number of fabricated metal products, and it does not appear that a reduction in the demand for metal fabricated products will take place in the future. The demand for all products is increasing and metal fabricating industries are more productive than ever though materials other than metals are being introduced in the fabricating industries.

TYPICAL JOBS

It is difficult to estimate the number of metal fabricating establishments in this country. Likewise, the number of workers employed in this industry is difficult to ascertain.

Most of the jobs common to the manufacturing industry are present in the fabricated metals industry. The jobs in this group range from unskilled workers to highly skilled workers engaged in chipping, forming, separating, shearing, and conditioning. Of course, there also are skilled workers who operate such equipment as lathes, grinders, milling machines and shapers.

Some of the higher level positions in the fabricated metals industry are found in areas of engineering, chemistry, office, mathematics, management.

Promotions and job advancements in unskilled, semi-skilled and skilled jobs are typically based on seniority and in some of the skilled jobs, beginners even may expect apprenticeship requirements.

EXPECTED WORKING CONDITIONS

Since the manufacture of such products is not directly dependent on the accessibility of natural resources directly, those involved in metal fabrication may be located in any area of the country. Metal fabricating establishments are typically located near large cities or industrial centers.

A majority of the plant jobs are concerned with preparation or processing metal raw materials. This means that most skilled and unskilled workers perform their jobs under conditions that are often hot and dirty. Some of the larger establishments, however, have installed air conditioners and have instituted the latest cleaning and safety equipment and procedures.

Most of the metal fabricating industries are union shops as a result, complete insurance and retirement plans may be found.

THE FUTURE OF THE INDUSTRY

The outlook is for continued growth in the manufacture of fabricated metals. There are increased demands for construction, transportation and metal products in general, as well as a need for fabricated metals to construct computers and other technological equipment. There is computerized monitoring of production and other technological adaption in the industry which creates the additional fabricated metals demand.

MACHINERY, EXCEPT ELECTRICAL

DESCRIPTION OF THE INDUSTRY

Machinery is a basic requirement of all manufacturing industries. The products of this group of manufacturers, therefore, have a direct impact on all other manufacturing endeavors.

This very important group of manufacturing plants includes those that produce all types of industrial machinery and equipment powered by built-in or detachable motors (does not include elec-

trical or transportation equipment). Categories of machinery included in this group are:

Electronic computers
Data processing equipment
Farm machinery and equipment
Construction, mining and materials handling equipment
All other types of manufacturing and processing machinery utilized by other industries

TYPES OF PRODUCTS

Establishments in this category are engaged in the manufacture of machinery and equipment in the following broad categories:

1. Engines and turbines (steam engines; steam, gas and hydraulic turbines and generator set units; internal combustion engines for diesel or semi-diesel machinery, marine and other uses);

2. Farm machinery and equipment (tractors for planting, harvesting, soil maintenance, or other farm operations);

3. Construction, mining and materials handling machinery and equipment (bulldozers; concrete mixers; cranes; pavers and power shovels; coal breakers; mine cars; core drills and rock cutting machinery; oil field machinery and equipment; lifts and conveyors: elevators, automobile lifts, dum waiters and moving stairways, conveyors and conveying equipment; hoists, industrial cranes and monorail systems; industrial trucks, tractors, trailers and stackers);

4. Metal working machinery and equipment (machine tools; metal cutting and metal working equipment; metal-forming equipment; special dies and tools, die sets, jigs and fixtures; machine tool accessories and measuring devices; metal working machinery and power driven hand tools);

5. Special industry machinery (food products machinery; machinery for textiles, woodworking, paper industries, printing trades, cotton ginning, smelting and refining, etc.);

6. General industrial machinery (pumps, air and gas compressors; ball and roller bearings; blowers and ventilation fans, mechanical power transmission equipment, industrial process furnaces and ovens);

7. Office, computing and accounting machines (typewriters; electronic computer and data processing equipment; calculating and accounting machines; commercial laundry, dry cleaning and pressing machines; air conditioning equipment and commercial equipment; measuring and dispensing pumps; service industry machines: floor sanding machines, industrial vacuum cleaners, commercial dishwashing machines);

8. Miscellaneous machinery (pistons; metallic packing automobile machine shops; amusement parks).

IMPORTANCE

As evidenced by the vast array of products in the non-electrical machinery category, the importance of this industry cannot be overstated.

Further evidence of the critical relationship of these industries to the overall economic viability of the United States is stressed in the following statistics:

1. The manufacturers employ 1.8 million workers.

2. More than $14 billion dollars are earned by the workers.

3. Approximately 65,000 people are engaged in administrative and auxillary services.

4. The value of annual shipments from this industry is over $48 billion dollars.

5. Plants of this industry manufacture most of the machinery and equipment used in all of the other manufacturing categories.

6. Products are generally manufactured as a job shop (one or two at a time).

7. Many items require specialized teams to design, build, install, and sometimes maintain highly complex apparatus.

Some of the problems related to the production of non-electrical machinery are as follows:

1. Many companies in this category are plagued with air and water pollution problems.

2. The manufacturers must be alert to Governmental standards and other specialized problems such as:

   a. Oilfield operations must protect against ocean oil spills and also fence oil spills;
   b. Noise abatement;
   c. Maintaining clean air; and
   d. Pollution control.

Locations of establishments in this industry are as noted below:

1. Metal Cutting and Metal Forming

   Midwestern States
   Middle Atlantic States
   New England States

2. Tool and Die Products

   East North Central States

3. Farm and Construction Machinery

   Midwestern States of

Ohio	Iowa
Indiana	Wisconsin
Illinois	Minnesota

4. Oilfield Machinery

   Texas
   Oklahoma
   California

Establishments in specific categories are often found in close proximity to major users.

TYPICAL JOBS

Workers employed in the manufacturing aspects of the industry can be at any level. This includes:

Unskilled	Technical	Personnel
Semi-Skilled	Professional	Accounting
Skilled	Managerial	Clerical

Production workers in this industry include trade apprenticeships that require four to five years plus 500 to 700 classroom hours of instruction. Examples of these trades are:

Tool and die maker	Millwright
Patternmaker	Machinist

Opportunities in this industry are controlled becuase of unionization, apprenticeships, and seniority. However, career ladder opportunities do exist and promotion can be relatively steady for persons willing to remain with this field and acquire the necessary training with another feature of this industry that uses trained apprentices for sales because of their accumulated knowledge of machinery.

EXPECTED WORKING CONDITIONS

Conditions in the non-electrical machinery and equipment industry are listed as follows:

1. Wages are at or near the top of those for production employment.
2. The industries are heavily unionized.
3. Workers receive benefits such as: sick leave, vacations, medical insurance.
4. Work areas are well lit and well ventilated.
5. Noise levels are high.
6. Jobs are subject to hazards such as dust, grease, cuts, burns, or falling metal.
7. Requires physical strength.
8. Requires on-the-job training.
9. Some jobs are repetitive.
10. Routine work must be accomplished rapidly and steadily.
11. Work is on a twelve-month basis.
12. Work fluctuates with economic cycles.
13. Overtime is common.

THE FUTURE OF THE INDUSTRY

Employment opportunities in the manufacture of non-electrical machinery industry are declining with a few exceptions. The future depends on several factors, some of which are:

1. The industry is heavily unionized.
2. Most jobs require some sort of formal apprenticeship program.
3. The industry is susceptible to changes in economic style.
4. Manufacturing of machinery and equipment is concentrated within a relatively small geographical area.
5. Exports are on the increase for this industry.
6. Profits and employment are currently low.
7. Demand for tool and die products is low.
8. Farm machinery, construction machinery and materials handling equipment show a growth rate.
9. The machinery and equipment for the textile industry is down 25%.
10. Machinery and equipment for the oil fields are on the increase.
11. Machinery for the air conditioning and industrial refrigeration are still in demand.
12. Machinery for food processing and printing is still in demand.
13. Imports are greater than exports of steam, gas, and hydraulic turbines.
14. Highly skilled and technologically oriented workers are in demand.

ELECTRICAL MACHINERY, EQUIPMENT AND SUPPLIES

DESCRIPTION OF THE INDUSTRY

The electrical machinery manufacturing industry provides machinery, equipment and supplies which become the component units utilized by virtually all other industries because of their vast dependence upon electrical power. Establishments in this group are engaged in manufacturing machinery, apparatus, and supplies for the generation, storage, transmission, transformation and utilization of electrical energy. This includes both home and industrial users.

TYPES OF PRODUCTS

Products included in this industry fit the following categories for electrical machinery, equipment and supplies utilized in the industry:

1. Electrical transmission and distributing equipment;

   Electrical measuring and testing
   Power distribution and transformers
   Switchgear, switchboard apparatus and metering panels.

2. Electrical industrial apparatus;

   Motors and generators
   Railway motors
   Control equipment for electrical or gasoline bases and tracks
   Industrial control equipment and accessories
   Welding apparatus
   Carbon and graphite products
   Blasting machines, condensers and rectifiers.

3. Household Appliances;

   Cooking equipment
   Household and farm refrigerators and freezers
   Household laundry equipment
   Electrical housewares such as hotplates, blenders, fans, vacuum cleaners, sewing machines, waste disposers, water heaters.

4. Electric lighting and wiring equipment;

   Electric bulbs
   Fluorescent and vapor lamps
   Lighting fixtures
   Current-carrying wiring devices
   Non-current carrying wiring devices.

5. Radio and Television;

   Equipment for home entertainment
   Public address systems
   Equipment for music distribution
   Phonograph records
   Tapes.

6. Communication equipment;

   Telephone and telegraph apparatus
   Radio and television transmitting and detection equipment
   Broadcasting equipment
   Cyclotrons
   Navigation equipment.

7. Electronic components and accessories;

   Radio and television receiving tubes
   Cathode ray picture tubes
   Semiconductors
   Related devices such as rectifiers, transistors and solar cells.

8. Miscellaneous equipment and supplies,

   Storage batteries
   Dry and wet primary batteries
   X-ray apparatus
   Tubes and electrical equipment for internal combustion engines.

IMPORTANCE

Since industry in this country has an almost immeasurable dependence upon electrical power, and since the industry provides electrical machinery, equipment and supplies which become the component units utilized by such industries, its importance to U.S. manufacturing almost staggers the imagination. Moreover, the growth in its importance has literally been unparalled in recent years. In 1949, it was described as having an annual volume of 2.5 billion. By the year 1970, this annual volume had grown to a total of 23 billion.

In point of fact, at the present time the United States accounts for approximately 60 percent of all the electronics equipment manufactured in the free world.

Today we are so heavily dependent upon electrical machinery, equipment and supplies that our lives without them would be unthinkable. Even a hasty glance at the range of products involved in this country will show that they will affect every moment of our lives in some manner or another.

On the other hand, we have not yet by any means seen the full impact that this can have upon us. To cite only a few instances:

There is a branch of electronics (astrionics) centering about the electronics technology involved in space flights and its application to other fields;

Another field (intellectronics) deals with the processing and storing of information and could have a powerful effect on the future of education;

Another field deals with low temperature electronics which will have tremendous implications for us since electrical conductivity increases as temperatures drop lower and lower.

Each one of these fields is believed capable of exercising great impact upon our lives. None has even begun to demonstrate its full impact as yet. It is obvious that the full significance of this industry has yet to be realized.

TYPICAL JOBS

In this industry, there are to be found all of the plant or factory jobs usually associated with other types of manufacturing. These jobs range from unskilled and trainee level posts through those of the semi-skilled level to the highly skilled. There are also professional and managerial jobs equivalent to those in other manufacturing industries. Typical jobs are:

Assembler	Accounting Clerk
Inspector	Personnel Representative
Foreman	Administration Clerk

This industry also places heavy emphasis upon technical, scientific and engineering skills. This is the kind of circumstance to be expected in an industry which shows obvious potential for new inventions, new discoveries and even in new frontiers. In the technical area, a common progression could start at the junior

scientist level and progress to a science researcher, then to a position of senior scientist in a span of time which depends on individual effort.

It is also possible for the individual to begin at the technical level and rise to the senior scientist category with proper training and experience. This can be observed with a visit to a local manufacturing company. The visit could also make the student aware of other jobs that are available in this occupational field.

Students are also welcomed by professional organizations as guests and there they could become acquainted with various representatives of local industries in the manufacturing of electrical machinery, equipment, and supplies.

EXPECTED WORKING CONDITIONS

There are a number of factors that influence working conditions in this industry; certain of these are beyond the control of the industry itself. When this industry is even reasonably prosperous, employment is year around. On the other hand, certain elements of this industry are heavily dependent upon government spending; and when this eases up, there may be layoffs of large numbers of even highly trained personnel. As a result, people employed in this industry sometimes have to undergo retraining and relocation in order to become re-employed at the level to which they are accustomed.

Because of the general expansion of this industry, however, employment security is reasonably good. There are also numerous opportunities for achieving satisfying specialties, even for the person who does not have a college degree.

Most work in this field is done on a team basis. This allows for satisfying interaction with other people, although sometimes group pressures can cause stress and unsatisfying working conditions.

Minority groups find ready acceptance in this industry. Plants in this field are located in almost every area of the country. Personal benefits are usually very satisfactory, in part because this industry is heavily unionized.

THE FUTURE OF THE INDUSTRY

Jobs in this category of manufacturing have been most prestigious even for people who lack professional status. Some of these most prestigious fields are experiencing cutbacks, examples of which are occurring because of reductions in the aerospace industry

and in military spending. This has resulted in a lack of uniformity in the employment outlook throughout this group of manufacturers. It is difficult to be precise about this from one period to the next, since prospects in fields that involve heavy government subsidies varies with economical, governmental and geographical situations.

Even in the field of home appliances some variations in business occur. Foreign competition is extremely keen in this occupational field. On the other hand, electronic component industries will probably be utilized to help solve environmental problems; this is a relatively new market that could serve a long range growth area.

Manufacturers of measuring and controlling instruments are looking forward to a bright future, at least in the next decade or so. There are various factors responsible for this. One is the push for increased automation to hold down costs of labor. Another is an increasing demand for such devices as those which monitor and control pollution. These factors could result in a strong demand for instrumental technicians, electronic technicians, environmental research technicians and instrument makers. Associated with this development will be a need for instrument repairmen, instrument installers, and industrial control equipment assemblers.

Since many plants in this manufacturing industry are concerned with the production of equipment for the generation, distribution, and transformation of electric power, increased accelerated demand for power, points to a stable job market in this area. It suggests that the greatest demand in this industry will be for highly trained and technically proficient employees.

The most difficult factor to evaluate here involves foreign competition. Increasingly it appears that it may be a factor influencing employment in this field. At this juncture, the reaction of the United States Congress to this is difficult to judge. It is possible that some restraints will be placed upon United States imports in this area.

TRANSPORTATION EQUIPMENT

DESCRIPTION OF THE INDUSTRY

The transportation manufacturing industry produces equipment for transportation of passengers and cargo by land, air and water.

Transportation, as defined here, is extremely broad, including not only vehicles and crafts, but also such stationary devices as pipelines for the transportation of oil.

TYPES OF PRODUCTS

The products involved with this broad field are broken down into fifteen general groups. They are:

1. Motor vehicles (from assembly plants)
2. Passenger car bodies
3. Truck and bus bodies
4. Motor vehicle parts and accessories
5. Truck trailers
6. Aircraft (from assembly plants)
7. Aircraft engine and engine parts
8. Aircraft propellers and propeller parts
9. Aircraft auxiliary equipment
10. Ship building and repairing
11. Boat building and repairing
12. Railroad locomotives and parts
13. Railroad and street cars
14. Motorcycles, bicycles and parts
15. Transportation equipment not otherwise specified

IMPORTANCE

Transportation of people and goods from one place to another is very significant in modern life. As expressed in a 1961 Congressional report, National Transportation Policy, "Transportation is one of the tools required by civilized man to bring order out of chaos. It reaches into every phase and facet of our existence. Viewed from every standpoint, economic, political and military, it is unquestionably the most important industry in the world. You can no more operate a grocery store or a brewery than you can win a war without transportation. The more complex life becomes, the more indispensable are the things that make up our transportation system."

Some statistical data to stress this significance are:

1. Thirteen per cent of our nation's civilian population are involved in transportation.

2. Almost 20 per cent of our total expenditures for goods and services involve transportation.

3. Transportation sources pay over 17 per cent of our total federal taxes.

4. The average person travels 4,000 miles per year (3,600 of which is by automobile alone).

The development of the internal combustion engine and the resulting creation of hard surfaced roads brought the vast use of the automobile. Further mobility was enhanced with the development of jet engines in the mid-twentieth century.

Other specific factors related to transportation are:

Railroad Transportation: The railroad is the dominant mode in the transportation system in terms of movement of goods. Its role in passenger traffic has decreased significantly since the development of the automobile and the airplane. However, the railroad industry still represents a substantial investment. It ranks as one of the most important in the economy from the aspect of 600,000 employees and of the invested $30 billion dollar capital.

Water Transportation: The volume of all the earth's water totals about 340 million cubic miles of which about two per cent exists as ice.

Water carriers have begun to develop more efficient vessels and operating conditions and much attention is currently being given to developing new port design for containerized operations.

Water carriers, therefore, will probably continue to be a significant factor in the movement of bulk products such as:

Petroleum	Coal
Chemicals	Building materials
Grains	

Highway Transportation: The technological development of the internal combustion engine and the highway system heralded the use of a transport system that literally changed the American way of life.

Automobiles: The development of the automobile has expanded the commuting distance from five miles in 1900 to 25 miles today.

Currently, more than two-thirds of all Americans live in urban areas. By 1980, three of every four will live in and around cities.

This large scale concentration of people in cities has been brought about by improved transportation, but many transportation experts say that cities have now grown to the point where they threaten the system that made them possible.

Most people are seeking means of transportation that will provide them with the following:

Convenience	Flexibility	Speed
Comfort	Privacy	Economy

Since the automobile is the only transportation device that provides this combination, other transport alternatives must approximate this combination of qualities if it is to gain public acceptance.

Bus and Truck: Virtually all movement of goods within urban areas and 21 per cent of all inter-city movement of goods is by truck.

Further developments in the trucking industry will include the following:

More efficient handling of goods	Computerized Control
Automation	Containerization

The bus has not proved to be a successful means of mass transportation in urban areas. Nevertheless, increased attention is being given to preferential use of existing highway lanes, as well as the development of a median strip for exclusive bus use. This is being done in order to:

Increase capacity and speeds
Reduce accidents
Provide comfort and convenience to commuters

Air Transportation: The growth of air transportation is perhaps the most remarkable development in the twentieth century.

It provides virtually unlimited mobility to hundreds of people all over the world. In terms of time, air transportation adds a new facet to every aspect of man's existence.

Until recently, only the wealthy could enjoy the pleasure of travel to exotic parts of the world. Today's jet age has shrunk the world in time so as to make foreign travel within reach of most people.

Pipelines: This is a category that may be overlooked while considering transportation, but pipelines do involve the movement of goods and belong to this category.

It is important to note that pipelines have become a subject of some controversy as a result of the increasing concern about the environment.

TYPICAL JOBS

Most manufacturing centers about the "assembly processes" in the field of transportation.

In small plants, workers move to the vehicle being assembled, whereas in larger plants, the vehicle moves to the worker on the assembly line.

The work varies in smaller plants and a worker may undertake a variety of tasks, but in larger plants each worker usually has a specialized task to perform.

Since the transportation industry is so vast and includes thousands of jobs, only one aspect will be illustrated to give the student an idea of typical job availability.

Among jobs in a large automobile manufacturing plant are:

1. Automobile Assembler (major, minor, trim);
2. Welder; and
3. Spray Painter.

Assemblers deal with different parts of the automobile but each assembler will work on a particular part of the vehicle. Each assembler usually has a helper.

Other jobs are:

Body Builder	Grinding and Polishing Laborers
Materials Handler	Sander and Painter

The gigantic plants involved in mass production of automobiles involve huge assembly lines with specialized jobs.

The smaller plants are for specialized crafts or vehicles and, therefore, people perform more varied functions with the average salaries and hourly rates in this industry usually higher than most industries.

Job entry is usually as a helper in the automobile industry and promotions sometimes require considerable service with an employer, but all of these manufacturing functions require the support of various levels of administrative and clerical personnel.

EXPECTED WORKING CONDITIONS

Transportation manufacturing industries are heavily influenced by the state of the economy, seasonal factors and the condition of the export-import market. As a result, this is a field where employees who have not had a chance to build up much seniority may experience seasonal layoffs.

The large automobile manufacturing plants are also subject to strikes from time to time, although the unions usually make an effort to subsidize their striking members during such periods.

Some factors relative to conditions in this industry are:

1. Wages are usually above the average;
2. Benefits are very sound;
3. Employment in large plants is repetitive;
4. Jobs can create tensions because of time limitations for tasks and due to the noise factor;
5. Workers are generally more satisfied in smaller plants;
6. Small plant workers are more likely to experience layoffs;
7. Small plants are less likely to be unionized;
8. Benefits in small plants are likely to be less desirable.

THE FUTURE OF THE INDUSTRY

The employment outlook in the field of transportation is a matter that cannot be generalized, therefore, some of the significant aspects of employment in the future are noted below. They are:

1. Jet Aircraft - production is currently in a slump and is expected to fluctuate over the next several years.
2. Boats - production of leisure types is on the increase, but may be affected by any depression in the American economy.
3. Passenger Cars and Railroads - production is on the decline but prospects are bright for growth in railroad freight operations.
    a. Possible 50% growth rate by 1980.
    b. Possible 100% growth rate by 1985.

4. Trucking - expected continued growth.

5. Automobiles - the most dominant of all in the industry of transportation.

   a. Used for 85% of all trips under 50 miles;

   b. May lose this dominancy in the future because of crowded cities and mass transit development;

   c. Is still expected to grow at a 3% rate in the future;

   d. More entry level jobs will become available each year due to turnover because of job monotony.

The transportation industry as a whole will continue to be a field of growth. The only stipulation which must be made is that since it is such a broad field, young people entering it should be alert to the variations that exist within the field and to where opportunities are available.

PROFESSIONAL, SCIENTIFIC AND CONTROL INSTRUMENTS

DESCRIPTION OF THE INDUSTRY

The professional, scientific, and control instrument manufacturing industry includes the following groups:

1. Mechanical measuring engineering instruments;

2. Laboratory and scientific research instruments;

3. Optical instruments and lenses;

4. Surgical, medical and dental instruments, equipment and supplies;

5. Ophthalmic goods;

6. Photographic equipment and supplies; and

7. Watches and clocks.

TYPES OF PRODUCTS

Products in this category may be classified as follows:

1. Engineering, laboratory and research instruments;

2. Nautical and navigational equipment;

3. Surveying drafting and research;

4. Instruments for measuring temperature, pressure and vacuum,

5. Instruments for measuring fluid flow and other physical characteristics;

6. Automatic temperature controls;

7. Optical instruments and lenses;

8. Surgical, medical and dental instruments;

    Orthopedic
    Prosthetic
    Surgical appliances and supplies
    Dental equipment and supplies.

9. Ophthalmic goods;

    Frames
    Lenses
    Sunglass lenses.

10. Photographic equipment and supplies;

    Still and motion cameras
    Projection apparatus
    Paper
    Plates
    Prepared photographic chemicals.

11. Watches and clocks;

    Clockwork operated devices and parts
    Watchcases.

IMPORTANCE

Instruments and control devices play a vital role in the operation of all scientific and industrial fields. Some of these fields are:

Missiles and space	Electronics	Rubber
Glass and ceramics	Public Utilities	Plastics
Pulp and paper	Medicine & health	Electrical engineering

The devices are used to measure, indicate, record, and control almost any type of variable encountered in this wide variety of industries. Some of these variables are:

Temperature	Chemical Composition
Pressure	Level of Material
Flow	Position
Velocity	Density

The variables are measured and controlled in order to manufacture the articles more efficiently, maintain uniform quality and exercise control over safety of operations.

These industries employ 400,000 people with an annual payroll of $2,900,000,000.

TYPICAL JOBS

There are many jobs in the professional, scientific and control instruments manufacturing industry. These jobs cover a broad range and include the following:

Technicians	Engineers
Instrument Repairmen	Environmental-Research Test Technician
Field Service Engineers	Meter Servicemen
Rocket-Control Technicians	Panel-Instrument Repairmen
Instrument Technician	Service Engineer
Inspector	
Assembly Lines	

The person motivated toward this industry is usually interested in engineering and technical work but does not want to spend five years in college. Education preparation for this industry should include a broad theoretical background in science and mathematics as well as practical knowledge of instruments and instrumentation.

Educational requirements recommended are:

1. Post high school training such as:
   a. Two years at a technical school
   b. Two years engineering school
   c. A Junior College degree.
2. On-the-job training
3. Technical training
4. Apprenticeship.

EXPECTED WORKING CONDITIONS

Working conditions in the professional, scientific, and control instruments industry are generally clean, well-lighted and well-ventilated.

Some of the related job benefits are:

1. Workers work a 40-hour week;
2. Overtime is common;
3. General wages are dictated by agreements between unions and management;
4. Many opportunities exist for all minority groups;
5. Basic benefits such as: Paid vacations, Sick leave, Health and life insurance, Retirement plans.

This is a nation-wide industry which is easily entered through training.

THE FUTURE OF THE INDUSTRY

The future outlook of this industry is good for qualified people. Increased expenditures for research and development by government and industry will create hundreds of new openings each year. Additionally, replacement needs alone for those who retire or who are promoted and transferred will create new openings.

The ratio of technicians to workers is one in each hundred workers (1%). Within the next ten years, there will be a need for over one million of these specialists.

MISCELLANEOUS MANUFACTURING INDUSTRIES

DESCRIPTION OF THE INDUSTRY

Miscellaneous manufacturing includes all products not covered under the other manufacturing industries explored.

TYPES OF PRODUCTS

There are too many products that could fall under this heading and, therefore, cannot be described as the other manufacturing areas. However, some of these are listed below:

- Jewelry
- Silverware and Plated ware
- Musical Instruments
- Toys
- Brooms and Brushes
- Sporting and Athletic Goods
- Pens, Pencils and other artists materials
- Buttons and other miscellaneous notions

IMPORTANCE

The importance of miscellaneous manufacturing will vary in accordance with the type of product and individual interests.

TYPICAL JOBS

The jobs in each product manufacturing line will vary according to the complexity and its critical need.

EXPECTED WORKING CONDITIONS

The working conditions of miscellaneous product manufacturing will also vary with the complexity and criticality of the product.

THE FUTURE OF THE INDUSTRY

The future of each miscellaneous product manufactured will vary and is too extensive to explore.

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